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NEW YORK, MAY, 1914

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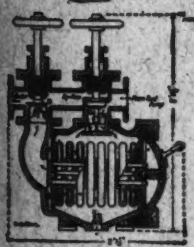

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The Heating and Ventilating Magazine

VOL. XI. No. 5

Contents for May, 1914

An "Electric" High School 17
Remarkable School Building at Rupert, Idaho, Heated throughout by Electricity.

Effect of Enclosures on the Heat Transmission Values of Radiators
George Stumpf, Jr. 23
Experiments Which Give the Added Amount of Surface to be Installed Under Various Conditions.

Ventilation and Cooling of Halls 33
Some Practical Examples Dealing With Large Interiors

Heating and Ventilation Laws and Regulations in the United States 36
III. Ohio. (Continued)

The Consulting Engineer 41
30—The Ventilation of Small Public Buildings.
31—Water as a Heat Conveyor.

Elbert Hubbard on Trade Papers. VIII. 43

Legal Decisions 44
Implied Warranty of Heating Plant.—Sale Under Patent or Trade Name. Enforcement of Lien.
Installing Plant.—Safe Working Place.—Reasonable Anticipation of Danger.

Current Heating and Ventilating Literature. 45

The Weather for March, 1914 46
New York, Boston, Pittsburg, Chicago and St. Louis.

National District Heating Association 48
Programme of Sixth Annual Convention.

American Society of Heating and Ventilating Engineers . . . 49
Date Set for Summer Meeting.
Annual Meeting of New York Chapter.
Illinois Chapter Discusses Methods of Testing Air Washers.
Massachusetts Chapter on Inspection Trip

Arrangement of Blower Systems to Reduce the Fire Hazard . . 52

Proposed National Separate Contract Law 53

The "Step" House, a New Type 54

Death of James E. Heg 56

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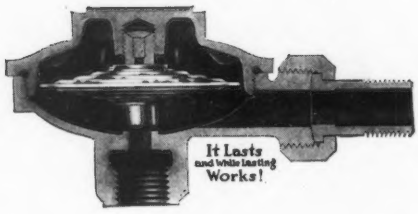

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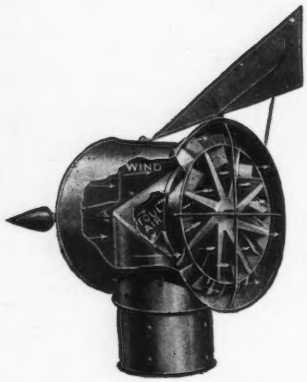

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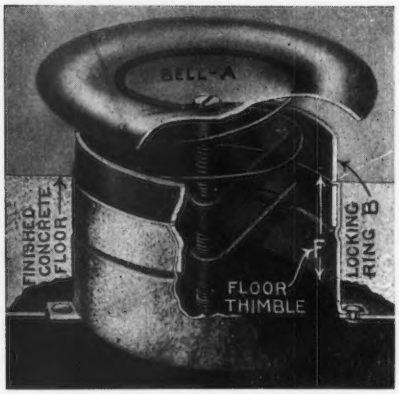

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK MAY, 1914

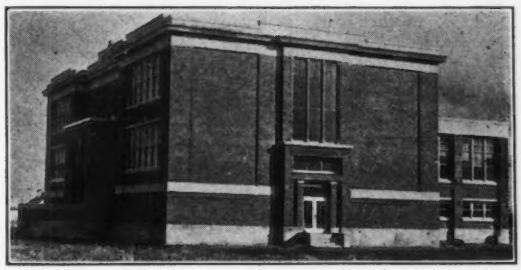
An "Electric" High School

REMARKABLE SCHOOL BUILDING AT RUPERT, IDAHO, HEATED THROUGHOUT BY ELECTRICITY.

The prophecy of an electrically-heated building at a cost of operation that would bring it within the limits of a commercially economical proposition, appears at last to have been fulfilled in the case of the "electric' high school at Rupert, Idaho.

It should be stated, however, at the outset that the electric current for heating purposes is obtained at a flat rate of $1.00 per kilowatt, per month. In addition to the electric heating system, electricity is used in this building for cooking, ironing, cafeteria, distilling water, for heating water for the shower baths, cooking rooms, science rooms and lavatories throughout the building; also for evaporation purposes in the chemical hoods, for the stereopticon in the auditorium and in the science lecture room; for a complete lighting system and for experimental purposes in the science room. Apparatus is also being prepared that will take the place of the Bunsen burners in most cases in the laboratories. If the odors from cooking ever become offensive, an electric ozonator will be installed for destroying these odors.

The Rupert High School is built of pressed brick, with gray imitation stone trim, and is three stories in height, as the basement, except the extension containing the gymnasium, is on the ground floor. The main part of the building is 65 ft. x 111 ft. and the rear extension is 43 ft. x 47 ft. The building has cubical contents of 300,000 cu. ft. All entrances, exits and stairways are of concrete and steel with iron railings and the partitions on either side of the hall running lengthwise of the building are of brick. The basement contains manual training rooms, rooms for cooking, sewing, cafeteria, agriculture, a gymnasium 40 ft. x 71 ft., dressing rooms, toilets,



RUPERT "ELECTRIC" HIGH SCHOOL, RUPERT, IDAHO.

shower baths and janitor's supply rooms, in addition to the rooms occupied by the transformers, heat units and plenum chamber.

The first floor contains the auditorium, library, superintendent's offices, teachers' rest rooms, class rooms.

The second floor contains class rooms, recitation rooms, science rooms, cloak rooms, boys' and girls' toilet rooms, etc.

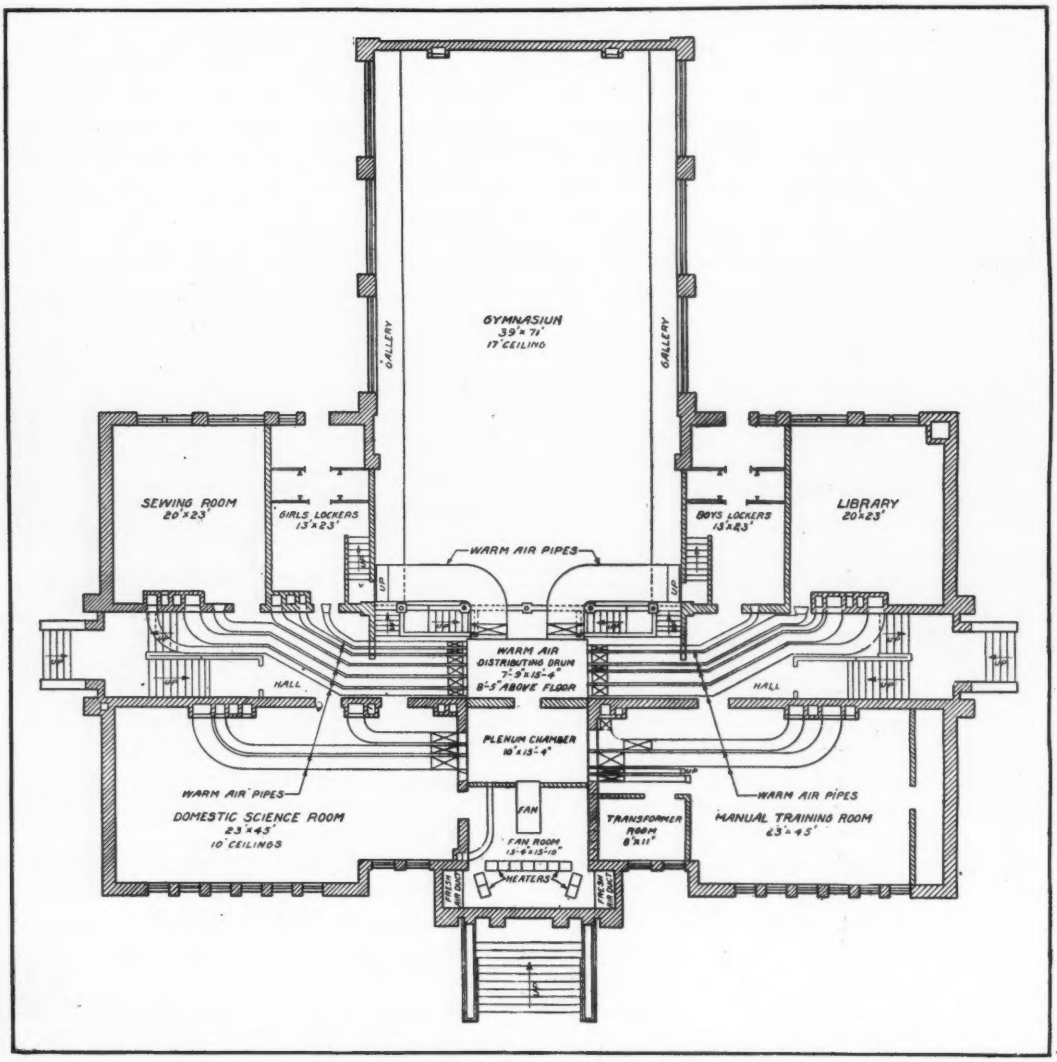
With no fire in the building and with transformer room, heater room and plenum chamber absolutely fire-proof, danger from fire seems to be reduced to a minimum. However, there are stand-

pipes, with fire hose, at either end of each corridor as well as in the offices.

The electric current used in the building comes from the Government power house at Minidoka Dam, 14 miles above Rupert on the Snake River. It is distributed by the Rupert Electric Company and sold at $1.00 per kilowatt per month, for heat, flat rate. The current passes through a transformer of 300 K. W. capacity, three-phase, Westinghouse self-cooling type, filled with oil. This transformer will stand an overload of one-third, so that a maximum of 400 K. W. is available. The transformer is fed from the 4,000 volt, four-wire distributing system of the Rupert Electric Company by underground cable.

The electric heating apparatus, which is arranged for use in connection with a hot blast heating system, is composed of 18 units, ten of which are shown in the accompanying illustration. They have a total capacity of 400 K. W. These units are connected in pairs vertically, each pair being under the control of a separate switch on the switch board in the principal's office. Each pair can be switched onto a 220-volt circuit or to a 440-volt circuit, thus giving 9 or 36 K. W. for that pair. By this arrangement, any degree of temperature in the rooms may be maintained.

The usual arrangement of dampers in the pipes is followed for the control of separate rooms, but it is seldom neces-



BASEMENT PLAN, RUPERT HIGH SCHOOL, SHOWING LAYOUT OF HEATING SYSTEM.

sary to use them, as the amount of air supplied to each room has been so accurately determined in accordance with its size that the temperature throughout the building remains practically uniform at any given time.

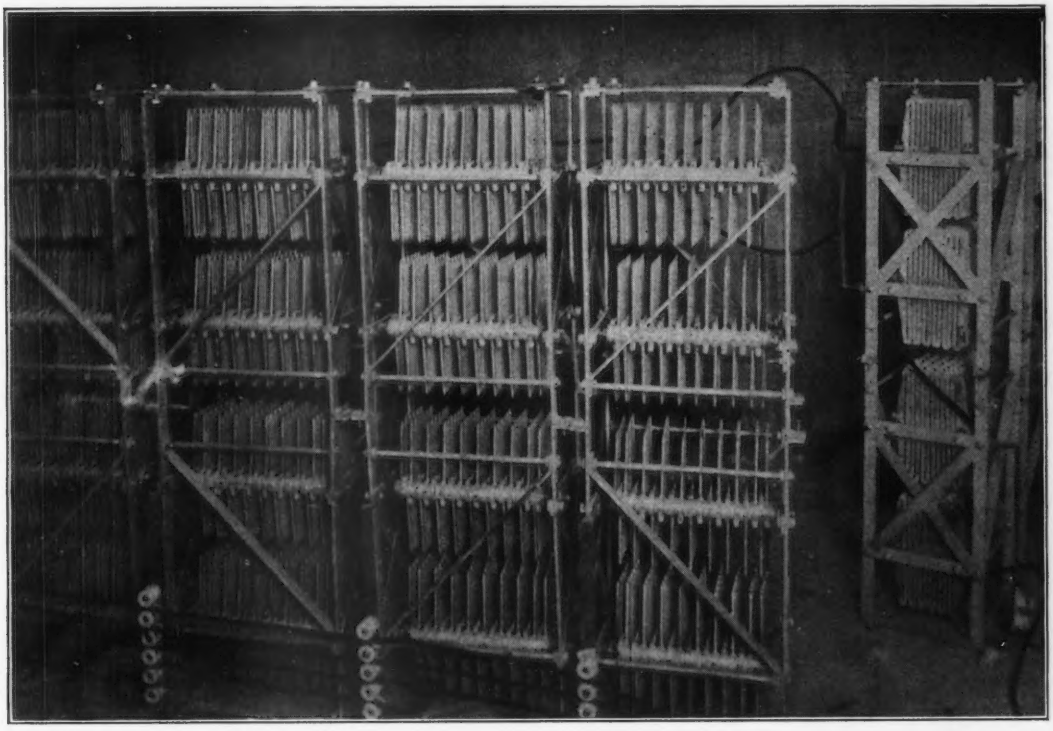
The fan for circulating the heated air is located in the same room as the heating units. A thermostat in this room connected with a solenoid in the transformer room, automatically shuts the current out of the transformer, if for any reason the fan should be stopped while the high heat is turned on.

This school is said to be the first large building in the world to be heated by this system of electric heat. The board of education and superintendent of schools had such faith in the feasibility and economy of the system that the building was erected with absolutely no provision for the installation of any other heating system.

The current was turned on in the middle of January, 1914, during bitter cold weather and heavy winds. The building was also new and damp. It was soon evident, however, that the maximum of current provided would never be needed, as the use of 261 K.W. was sufficient to keep the entire building at 70° F. with the thermometer outside at —15° F. It is estimated that the building will never again require a miximum of more than 250 K.W., although 400 K.W. are installed.

The small chamber containing the heat units and fan, and the adjoining plenum chamber, are located underneath the front entrance and hall. The fan, which has a capacity for supplying 20,000 cu. ft. per minute, draws the fresh air down the cold air shafts on either side of the front entrance and through the electric heaters, and forces this warmed air into the plenum chamber, whence it flows through the usual system of ducts and flues to the various rooms. The bottom of the plenum chamber contains water over which the heated air must pass before entering the warm air pipes.

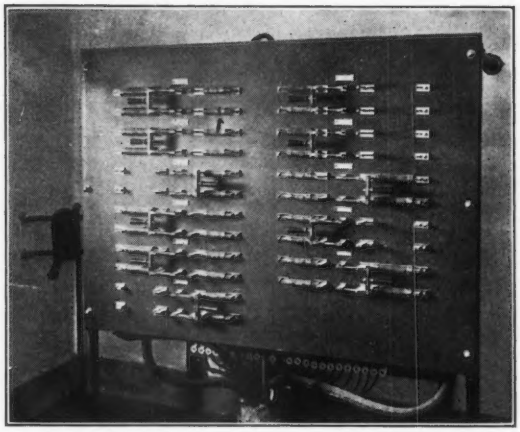
The warm air enters the rooms near the ceiling, while the vitiated air is forced out through exhaust ducts near the floor. With this arrangement an air change is effected in the different rooms every 15



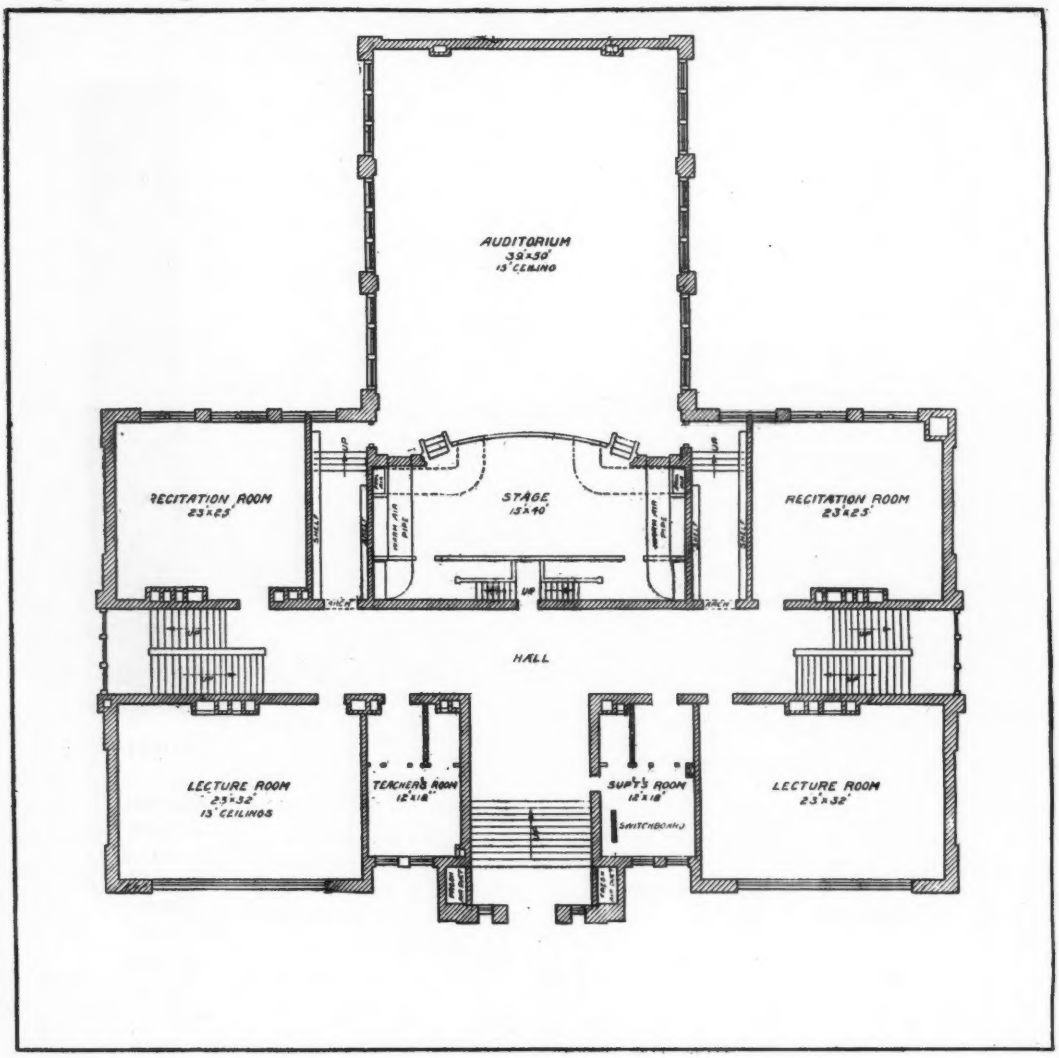
HEATER ROOM, RUPERT HIGH SCHOOL, SHOWING TEN OF THE EIGHTEEN SIMPLEX ELECTRIC HEATER UNITS.

minutes. The motor operating the fan is a 10 H. P., variable speed, General Electric motor, which also provides power for the various mechanical apparatus in the manual training room.

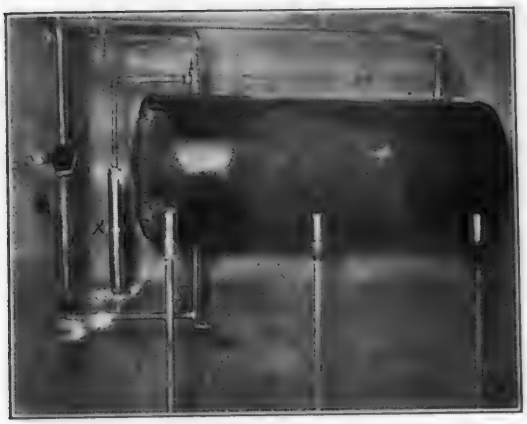
After the building is empty of pupils in the afternoon, the cold air shaft damper is closed, the fan is stopped, the switches are all put on the 220-volt circuit and the doors of the various rooms are opened into the corridors which now receive the warmed air from the heater room. In the morning, an hour or two before the opening of school, the fan is started to equalize the temperature throughout the building. When the temperature reaches 70° F., the fresh air dampers are again opened.



SWITCHBOARD IN PRINCIPAL'S OFFICE, RUPERT HIGH SCHOOL.
Emergency Switch Shown at Left.



MAIN FLOOR PLAN, RUPERT HIGH SCHOOL, SHOWING METHOD OF HEATING AND VENTILATING AUDITORIUM.

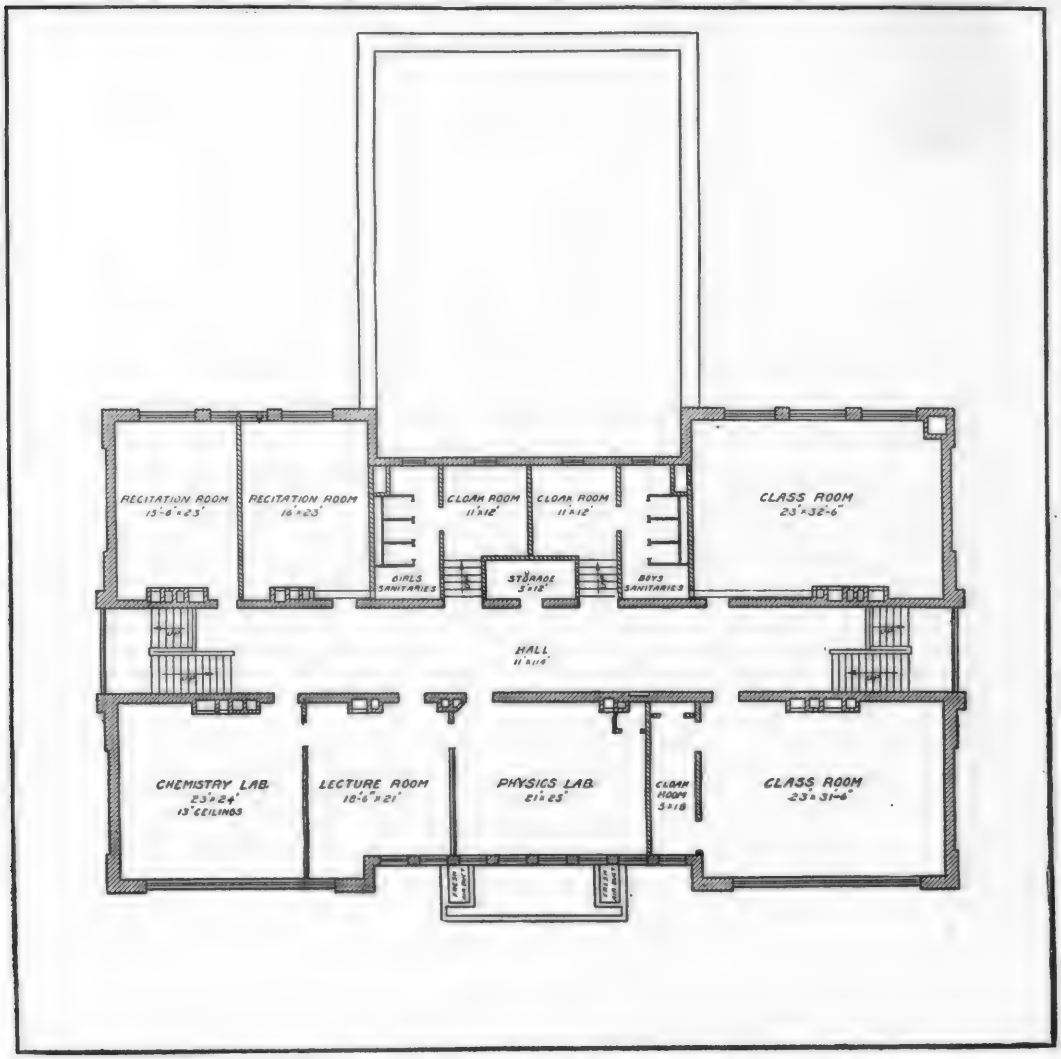


HOT WATER HEATER IN PLENUM CHAMBER, RUPERT HIGH SCHOOL.
Electric Water Heater Marked X.

The cost of the electric heating system is estimated to be $3,000 less than the cost of any system using coal as the source of heat. In addition much room has been saved for school purposes that would otherwise have been used for boiler, heater and fuel rooms.

As already stated, the current for heating purposes at a flat rate of $1.00 per kilowatt per month. The maximum amount used must be paid for for at least four months. For each of the remaining months the school is charged for the maximum amount used at any time during that month.

It has now been proved beyong doubt that the total cost for a year for current used for heating will not exceed $1,500.



SECOND FLOOR PLAN, RUPERT HIGH SCHOOL, SHOWING AIR FLUES.

COOKING ROOM, RUPERT HIGH SCHOOL, EQUIPPED WITH TWENTY 4½-IN. THREE HEAT ELECTRIC DISC STOVES.

This compares with an estimated cost for coal of $1,000. However, the use of coal would have required the services of a fireman at $75 per month. As the cost of the installation of the electric heating system was $3,000, the interest on this amount is figured as a further offset to the cost of electric current. The flat rate for current makes it possible to have the building warmed for evenings as needed for meetings, games, theatricals, lectures, etc., without extra expense. The building is planned for use as a model community center and the item just mentioned is therefore important. In addition to the other features mentioned there is the elimination of smoke, soot and dust.

In the foregoing estimate, the cost of the current for driving the fan is not included, as this charge is the same with any system of fan heating. The current for power purposes is supplied at meter rates which vary with the amount used. During March, 1914, the current for power cost $27.50 and this includes the power for driving the fan and all machinery in the manual training room. During the same month, the cost of current for cooking was $4.95; for water heating, $11.40; for lighting, $9.40. All of this current is supplied at meter rates and varies with the amount used. A part or all of the building has been in use practically every evening during the month named.

The total cost of the building, including heating, wiring and plumbing, was $47,000, or about 15 cents per cubic foot of space or $235 per pupil capacity. This amount includes the building of septic tanks for sewage disposal. The auditorium is equipped with opera chairs and has a large stage, the stage lighting being exceptionally fine, comparing to that of the better class of theatres.

The building was designed by John Visser, architect, Boise, to meet the requirements of the superintendent, George L. Dilworth and the local board of education. The entire heating and power equipment was designed by Harry Dibble, Government electrical engineer at the Minidoka Dam, and the Rupert Electric Company, the latter installing the system. The heating units and controlling switch board were furnished by the Simplex Electric Heating Company, Cambridge, Mass.

Effect of Enclosures on the Heat Transmission Values of Radiators

EXPERIMENTS WHICH GIVE THE ADDED AMOUNT OF RADIATION TO BE INSTALLED UNDER VARIOUS CONDITIONS.

BY GEORGE STUMPF, JR.

Considerable doubt exists among heating engineers and contractors as to the actual effect of enclosures on the heating values of radiators. In order to obtain definite relations between exposed and enclosed radiators, Professor K. Brabbée, of the Heating and Ventilating Testing Laboratory of the Royal Technical Institute of Berlin, has made some extensive experiments. The results were published in Gesundheits Ingenieure, a German publication, and the following translation of abstracts therefrom, which are applicable to American heating practice, has been made for THE HEATING AND VENTILATING MAGAZINE.

It was attempted to establish the relation between the efficiency of exposed and enclosed radiators by means of a mathematical formula. Several tests were made to determine the velocity of air and the temperatures at the inlet and outlet of the enclosure, but these readings varied so greatly at various points of the enclosure that no correct relation could be obtained by this means.

TESTS WITH STEAM RADIATORS.

All radiators—Plain surface, 10 sections, 3 in. on centers.

2-col. radiators, 8½ in. wide; 3-col. radiators, 9 in. wide.

The following notations are used throughout:

"k" = heat transmission coefficient = B. T. U. transmitted per hour per sq. ft. per degree F. difference between the mean temperature of heating medium and the surrounding air—when radiator is not enclosed and placed 2½ in. from the wall.

"P" = the increase or decrease of value of "k" expressed in per cent. as caused by the use of an enclosure.

"A" = free area of screens expressed in per cent. of total area.

Table 1 gives preliminary experiments with the radiators under consideration, to determine the value of "k" when radiators are not enclosed and placed 2½ in. from wall.

TABLE 1.

Radiator—49 in.—2-col.		24 in.—2-col.
"k"	=1.62	=1.74
Radiator—50 in.—3-col.		26 in.—3-col.
"k"	=1.38	=1.5

These values compare favorably with values of "k" for radiators of American manufacture as given by Professor J. R. Allen:

Radiator = 38 in. 2-col. "k" = 1.65
38 in. 3-col. "k" = 1.45

These values are all for still air and for rooms with an average exposure; it is evident that an increase in circulation of air or an exceptional cold outside exposure near the radiator will raise value of "k".

However, the percentage ("P") of difference as caused by an enclosure will be the same regardless of what value of "k" is assumed to be correct for the exposed radiator.

The writer recommends the use of different values of "k" for radiators of different heights and widths, as there is as much as a 10% variation between 1 and 2-column, 15% between 2 and 3-column, and as much as a 10% variation in different heights. Low radiators are more efficient than high ones(if of same depth) and narrow ones more than wide ones (if of same height).

Experiment 1.

EFFECT OF VARIOUS DEPTHS OF AIR SPACE IN FRONT AND REAR OF RADIATORS.

(A).

Enclosure Fig. 1.

Radiator = 49 in. 2-col. 10 sec. 30 in. long.

Inlet (I) = 5 in. × 30 in. (open slot).

Outlet (O) = 10 in. × 30 in. (screened).

Free area of screen (A) = 64%.

TABLE 2.

Test	5	6	7
Distance F between radiator and front of enclosure, inches	1¼	2½	4
Distance R between radiator and rear of enclosure, inches	1¼	2½	2½
P in per cent	—8.7	—8	—9.2

From Table 2 it is obvious that an air-space 2½ in. deep in front and rear of radiator is the most efficient.

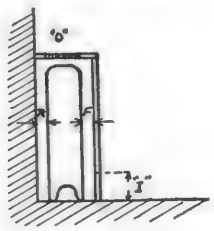


FIG. 1.

Test 5 indicates the effect of decreased velocity of the air passing over the radiator which is caused by decreased area and greater frictional resistance.

Test 7 indicates a greater loss in efficiency due to increased area for air passage and consequent decrease in velocity. The velocity is decreased, because the area of inlet and the motive power due to heat given out by radiator, causing the air movement, are constant. Therefore, Test 6 gives the proper spacing of the radiator to obtain the greatest efficiency (B).

Radiator = 24 in. 2-col. 10 sec. 30 in. long.

Not enclosed—placed against a wall having cold exposure.

TABLE 3.

Test	8	9
Distance from wall, in.	2½	6
"P" in per cent	0	—3.5

Test 9 verifies results obtained in Table 2 and that most efficient spacing is 2 in. or 2½ in.

Experiment 2.

Radiator = 49 in. 2 col. 10 sec. 30 in. long.

Enclosure—Fig. 2. Having no top.

TABLE 4.

Test	13	14	15	16
Height of enclosure "h" in.	52	52	52	72
Inlet, open slot, in.	6½x30	9x30	12x30	12x30
P in per cent	+2.2	+6.3	+12.5	+13

Table 4 shows that enclosures without a top create an increase in efficiency of the radiator of about 12% if the area of the inlet in square inches is approximately ten times the heating surface of the radiator in square feet.

All of the foregoing clearly proves that in order to maintain the efficiency of enclosed radiators as high as possible, it is necessary to compel the air to travel over the radiator at a maximum velocity and as nearly uniformly as possible over the entire length of the radiator.

Tests 13 and 14 show the desirability of obtaining large air inlets, and Tests 15 and 16 indicate the unimportance of making the enclosure higher than the radiator.

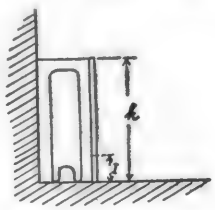


FIG. 2.

Experiment 3.

Tests made to determine the effect of screens of various designs showed that, if the same free area be maintained, the design of the screen has no appreciable effect on the heat transmission values.

Experiment 4

EFFECT OF SHELVES AT VARIOUS HEIGHTS ABOVE THE TOP OF RADIATORS.

Radiator = 49 in. 2 col. 10 sec. 30 in. long (Fig. 3).

TABLE 5.

Test	24	25	26	27	28	29	30	31
Distance "b" in inches	6¾				13½			
Distance "a" in inches	⅜	1½	3	4	⅜	1½	3	4
P in per cent	—4.5	—2.5	0	0	—7	—5	—3.5	—2

Table 5 shows the influence of narrow shelves, placed 1½ in. above the radiator, to be negligible, while shelves which extend out to the front of the radiator and are at least 1½ in. above the radiator reduce the efficiency value approximately 5% for high radiators.

From the same tests made with a low radiator, as given in Table 6, we learn that both narrow and wide shelves have a greater effect on low radiators than on

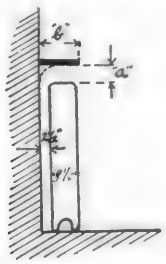


FIG. 3.

high ones, and that, if the shelves are placed 3 in. above the radiator the transmission coefficient will be reduced by 5%, while if placed only 1½ in. above, the reduction amounts to 10%.

All of the tests in the foregoing experiment were made with deflectors under the shelves, but it was found that the use of such devices had practically no beneficial effect.

Experiment 5.

OPEN RECESS—FRONT OF RADIATOR FLUSH WITH FACE OF WALL—(FIG. 4).

(1) Effect of distance "R" from rear of recess.

Radiator = 24 in. 2-col. 10 sec. "a" = 4 in.

TABLE 6.

Test	43	44
R=	2½ in.	5 in.
P=	—6%	—11%

This proves again that the most efficient air space between wall and radiator is about 2½ in.

(2) Effect of distance "a" over top of radiator.

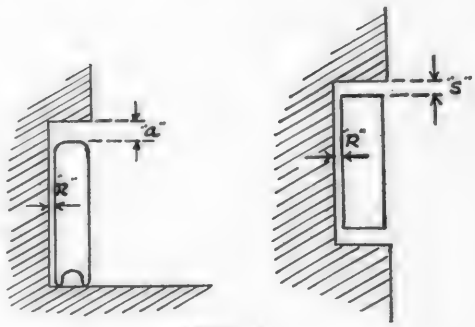


FIG. 4.

Radiator = 49 in. 2-col.—(Fig. 4)—"R" = 2½ in.

TABLE 7.

Test	45	46	47
"A" in inches....	4	3	1½
"P" in per cent..	—6	—7.3	—11

Table 7 shows that distance "A" has considerable effect on the efficiency of the radiator, and if 3 in. be assumed to be the minimum distance allowable, then a reduction of 8% in the heat transmission value will have to be made.

(3) Effect of distance "S" at sides of radiator (Fig. 4).

TABLE 8.

Test	48	49
"S" in inches.....	3	1
"P" in per cent.....	—11	—11

Indicating that size of air space at sides of radiators is of little importance.

Experiment 6.

EFFECT OF VARIOUS SIZES OF OUTLET SCREENS.

(a) Enclosures with air inlet in the front and air outlet in the top—(Fig. 5). Radiator 49 in. 2-col. 10 sec.

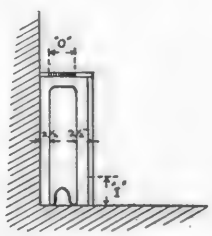


FIG. 5.

TABLE 9.

Test	50	51	52	53	54	55
Air inlet, open slot, in.....	2 x30	2 x30	2x30	2x30	2x30	2x30
Air outlet, screened, in. "A"=44%.....	10¼x30	8½x30	7x30	6x30	5x30	4x30
"P" in per cent.....	—12.2	—13.4	—19.2	—25.1	—30.5	—34.3

These results show that very little advantage can be obtained by making the width "O" of outlet screen larger than the depth of the radiator, but that if dimension "O" be made less than the width of radiator the efficiency is reduced a considerable amount.

The heat transmission coefficient of a radiator should therefore be reduced by 15% when the inlet slot is 2 in. high and the outlet screen is equal in size to the length and width of the radiator. For every inch that the outlet screen is made less than the width of the radiator the transmission coefficient should be reduced by 5% more.

(b) Effect of various sizes of open slot air inlets.

(1) High radiators—enclosure—Fig. 5.

It should be specially noted that the use of a 2 in. open-slot air inlet, which occurs quite commonly with low recesses, requires an allowance of about 25% loss in heat transmission coefficient of the low radiators.

(c) Effect of various sizes of screened air inlets.

(1) High radiators—Enclosure—Fig. 5.

Table 12 shows us that if the size of inlet screen for average conditions be taken as 8 in. high by the length of the radiator, which screen has the equivalent free area of a 3½ in. open slot, that a proper allowance for loss in efficiency of high radiators would be 15%, which agrees with conclusions drawn from Table 10.

Table 13 below verifies again the greater loss in efficiency of low radiators when enclosed and the loss in efficiency for these low radiators should be taken as fully 25%.

TABLE 10.

Test	56	57	58	59	60
Radiator=	——49. in —2-col.——			50 in.—3-col.	
Air inlet, open slot, in.	2 x30	3 x30	5 x30	2x30	4x30
Air inlet, screened, in. A=44%	10¼x30	10¼x30	10¼x30	9x30	9x30
"P" in per cent	—12.2	—10.5	—9	—22	—14

In general practice a height of air inlet slot of 3 in. to 4 in. for high radiators can be readily obtained—as the appearance of the front of the enclosure is not affected to any great extent. For this size of inlet the heat transmission coefficient of the radiator must be reduced by 15%.

(2) Low radiators—Enclosure—Fig. 5.

Table 17 and 18 show up the low 2-col. radiators at a disadvantage when compared with high radiators in enclosures, as per Fig. 5.

3-column radiators do not show this great variation in value of "P" for the different heights.

TABLE 13.

Test	70
Radiator=	24 in.—2 col.
Air inlet screened, in.	5 x30
"A" in per cent	44
Size of open slot equivalent to screened inlet	2¼x30
Air outlet screened, in.	8½x30
"A" in per cent	44
"P" in per cent	—26.5

TABLE 11.

Test	61	62	63	64
Radiator=	—24 in.—2-col.—		—26 in.—3-col.—	
Air inlet, open slot, in.	2 x30	4 x30	2x30	4x30
Air outlet, screened, in. A=44%	8½x30	8½x30	9x30	9x30
P in per cent	—27	—13	—21	—11.5

TABLE 12.

Test	65	66	67	68	69
Radiator=	——49 in.—2-col.——			—50 in.—3-col.—	
Air inlet, screened in	6 x30	8 x30	12x30	5 x30	8 x30
"A" in per cent	44	44	44	44	44
Size of open slot equivalent to screened inlet, in	2½x30	3½x30	5 x30	2¼x30	3½x30
Air outlet screened, in	12 x30	12 x30	12x30	9 x30	9 x30
"A" in per cent	44	44	44	44	44
"P" in per cent	—12	—10.5	—9	—17	—12

Experiment 7.

ENCLOSURES WITH AIR INLET AND OUTLET IN FRONT. See Fig. 6.

Top of enclosure 2½ in. over radiator.

(A) Air inlet and outlet—Open slots.

(1) High radiators—Fig. 6.

TABLE 20.

Test	71	72	73	74	75	76	77
Radiator		49 in.—2-col.				50 in.—3-col.	
Air inlet open slot, in.	2 x30	5 x30	9½x30	12x30	14x30	2 x30	5 x30
Air outlet open slot, in.	2 x30	5 x30	9½x30	12x30	14x30	2 x30	5 x30
"P" in per cent							
No deflector	—23.5	—17.5	—13	—10.5	—4	—25	—19.3
With deflector	—22	—15.5	—7.5	—4.7	—0.3	....	....

The results in Table 14 bring out clearly the undesirability of the use of the enclosure as shown in Fig. 6.

If the height of inlet and outlet slots be taken between 2 in. and 3 in. then the

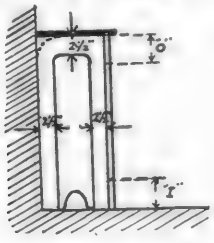


FIG. 6.

reduction in efficiency should be at least 25% for high radiators.

For low radiators (Table 15), with 2 in. inlet and outlet slots, there is a loss in efficiency of 33 1-3% for 3-col. radiator and 40% for 2-col. radiators These values appeared so exceptionally high that it was thought necessary to check by making additional independent tests—the results of all of which verified the above figures absolutely.

(2) Low radiators—Fig. 6. (See Table 21).

(b) *Inlet and Outlet Screened.*

(1) High Radiators—Enclosure—Fig. 6.

From the data contained in Table 16 it is obvious, if the minimum height of inlet and outlet screens be taken as 6 in., that the efficiency of high radiators must be reduced fully 25% when enclosed as shown in Fig. 6.

Table 17, giving results of similar tests, but with low radiators, requires a reduced heat transmission coefficient of 33% for low 2-col. and 25% for low 3-col. or more.

If conditions require the inlet and outlet screens to be reduced to 4 in. high the reduction in coefficient amounts to fully 40%.

(2) Low radiators—Enclosure—Fig. 6.

TABLE 23.

Test	87	88
Radiators	24 in.—2-col.	26 in.—3-col.
Air inlet screened, in...	6 x30	6 x30
Air outlet screened, ins..	6 x30	6 x30

TABLE 21.

Tests	78	79	80	81
Radiators	24 in.—2-col.		26 in.—3-col.	
Air inlet, open slot, in.	2 x30	4 x30	2 x30	4 x30
Air outlet open slots, in.	2 x30	4 x30	2 x30	4 x30
"P" in per cent. No deflectors.	—39	—22	—32	—16

TABLE 22.

Test	82	83	84	85	86
Radiators	49 in.—2-col.			50 in.—3-col.	
Air inlet screened, in.	5 x30	9½x30	14x30	6 x30	9½x30
Air outlet screened, in.	5 x30	9½x30	14x30	6 x30	9½x30
"A" in per cent.	44	44	44	44	44
Size of open slot equivalent to screened inlet, in.	2¼x30	4¼x30	6 x30	2½x30	4¼x30
"P" in per cent.					
No deflector.	—21	—15.5	—7	—25	—18
With deflector.	—18	—13	—5	....	....

"A" in per cent..	44	44
Size of open slot equivalent to screened inlet, in.....	2½x30	2½x30
"P" in per cent. No deflectors..	-33	-24

Experiment 8.

ENCLOSURES WITH PERFORATED SHEET STEEL FRONT. (Fig. 7.)

Top of enclosure 2½ in. above radiator.

TABLE 24.

Test	89	90
Radiators	49 in.—2-col.	50 in.—3-col.
"P" in per cent..	-19.5	-20

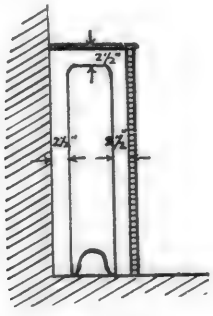


FIG. 7.

TABLE 25.

Test	91	92
Radiators	24 in.—2-col.	26 in.—3col.
"P" in per cent..	-18.5	-19.7

The reduction in efficiency of 2 and 3-col. low and high radiators—(when enclosed as per Fig. 7) can be taken as about 20%, as shown in Tables 18 and 19.

Experiment 9.

ENCLOSURES FOR RADIATORS IN WINDOW RECESSES OR SEATS WITH AIR SUPPLY TAKEN THROUGH TOP OF ENCLOSURE. (Fig. 8.)

Radiator = 24 in.—2-col. Air inlet and outlet screened. "A" = 44%.

TABLE 26.

Test	109	110	111	112
"D" in.....	2¾	4	6	8
"E" in.....	13¾	15	17	19
"P" per cent.....	-34.7	-27	-14	-10

This enclosure is very inefficient because in general heating practice it is almost impossible to have dimension "D" of air inlet made larger than 3 in. or 4 in. —so that it will be necessary to figure a loss in the heat transmission coefficient (k) for the radiator of fully 30 or 40%.

Experiments With Hot Water Radiators.

Tests were made to determine the value of coefficient "k" for hot water radiators not enclosed and placed 2½ in. from wall and under the following conditions:

Temperature of supply water... 176° F.
Temperature of return water... 140° F.
Average temperature of water.. 158° F.
Temperature of surrounding air. 68° F.

These results again show a variation of 10% in value of "k" in favor of the narrow radiators when compared with wide ones of same height and variation of 10% in favor of low radiators when compared with high ones of same width. (Table 27.)

A total of about 50 tests were made with various enclosures using hot water radiators. The results were found to vary so little from those obtained with steam radiators, under similar conditions, that it can be safely assumed that

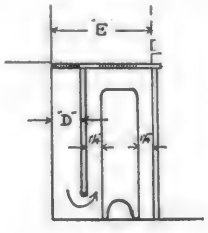


FIG. 8.

the values of "P," as expressed in per cent. of "k" for steam radiators, are exactly the same for hot water radiators.

Summary.

The following summary brings out more clearly the results obtained from the foregoing experiments and takes into account all practical conditions affecting the loss of efficiency of radiators in enclosures.

TABLE 27.

Test	113	114	115	116
Radiators	49 in.—2-col.	50 in.—3-col.	24 in.—2-col.	26 in.—3-col.
"K"	1.3	1.15	1.44	1.28

But first the values of "k" for the various heights and widths of standard radiators that are not enclosed should be noted, as shown in Tables 22 and 23. These values were compiled from the results of experiments made by Rietschel, Brabbée, J. R. Allen and various other well-known authorities, and have been used by the writer in general practice for some time.

Particular attention is called to the lower value of "k" for the 3-col. radiators, as compared with the 2-col. type. 4-col. radiators, as compared with the 3-col., show no such variation, which is probably due to the fact that the sections are placed 3 in. on centers, giving a larger area for the circulation of the air between the sections.

OPEN RECESSES. (See Fig. 4.)

Distance "A" 2 in. and less, "P" = —12%.

Distance "A" 2½ in. to 3 in., "P" = —8%.

Distance "A" 3½ in. to 5 in., "P" = —5%.

The effect of space at ends of radiator is to be neglected.

ENCLOSURES WITH AIR INLET IN FRONT AND AIR OUTLET IN TOP. (See Fig. 5.)

Air outlet screened of a size equal to length and width of radiator.

(A) Two-Column Radiators.

(1) Air Inlet — Open Slot.

For radiators 42 in. high and over	"I" = 3 in. or 4 in.,	"P" = —15%
For radiators under 42 in. high	"I" = 4 in.,	"P" = —15%
For radiators under 42 in. high	"I" = 2 in.,	"P" = —25%

(2) Air Inlet Screened ("A" = 44%).

For radiators 42 in. high and over	"I" = 9 in.,	"P" = —15%
For radiators under 42 in. high	"I" = 9 in.,	"P" = —20%
For radiators under 42 in. high	"I" = 5 in.,	"P" = —25%

(B) Three-Column Radiators.

(1) Open Slot Air Inlet.

All heights of radiators	"I" = 4 in.,	"P" = —15%
All heights of radiators	"I" = 2 in.,	"P" = —25%

(2) Air Inlet Screened ("A" = 44%).

For radiators 42 in. and over	"I" = 9 in.,	"P" = —15%
For radiators 32 in. to 38 in.	"I" = 9 in.,	"P" = —15%
For radiators 32 in. to 38 in.	"I" = 7 in.,	"P" = —20%
For radiators 26 in. and under	"I" = 9 in.,	"P" = —20%
For radiators 26 in. and under	"I" = 5 in.,	"P" = —25%

ENCLOSURES WITH AIR INLET AND OUTLET IN FRONT. (Fig. 6.)

(A) Two-Column Radiators.

(1) Air Inlet and Outlet—Open Slots.

For all heights of radiators	"I" = 5 in. "O" = 5 in.	"P" = —20%
For radiators 32 in. high and over	"I" = 2 in. "O" = 2 in.	"P" = —25%
For radiators 26 in. high and under	"I" = 2 in. "O" = 2 in.	"P" = —40%

(2) Air Inlet and Outlet Screened ("A" = 44%).

For radiators 42 in. and over	"I" = 8 in. "O" = 8 in.	"P" = —20%
For radiators 32 in. and 38 in.	"I" = 9 in. "O" = 9 in.	"P" = —20%
For radiators 32 in. and 38 in.	"I" = 7 in. "O" = 7 in.	"P" = —25%
For radiators 26 in. and under	"I" = 6 in. "O" = 6 in.	"P" = —33%

(B) Three Column Radiators (Fig. 6).

(1) Air Inlet and Outlet—Open Slots.

For radiators 32 in. high and over..... { "I" = 5 in. / "O" = 5 in. } "P" = —20%

For radiators 32 in. high and over..... { "I" = 2 in. / "O" = 2 in. } "P" = —25%

For radiators 26 in. high and under..... { "I" = 4 in. / "O" = 4 in. } "P" = —20%

For radiators 26 in. high and under..... { "I" = 2 in. / "O" = 2 in. } "P" = —33%

(2) Air Inlet and Outlet Screened.

For radiators 26 in. high and over..... { "I" = 9 in. / "O" = 9 in. } "P" = —20%

For radiators 26 in. high and over..... { "I" = 6 in. / "O" = 6 in. } "P" = —25%

SHELVES. (See Fig. 3.)

Front of shelf flush with front of radiator.

(A). Radiators 42 in. high and over.

Distance "A" 1 in. and less, "P" = —10%.

Distance "A" 1½ to 3 in., "P" = —5%.

Distance "A" 4 in. to 5 in., "P" = 0%.

(B) Radiators under 42 in. high.

Distance "A" 1½ in. and less, "P" = —10%.

Distance "A" 2½ in. to 5 in., "P" = —5%.

The effect of deflectors under the shelves can be assumed as negligible for practical purposes.

ENCLOSURES WITH PERFORATED SHEET STEEL FRONT (FIG. 7).

All heights of radiators with front screen of the full size of enclosure, "P" = —20%.

Same as above—but with deflector, "P" = —15%.

If an outlet screen be included in the top of the enclosure of same length and width of radiator, in addition to the full size front screen, "P" = —10%.

ENCLOSURE OF RADIATORS IN WINDOW RECESSES OR SEATS WITH AIR SUPPLY TAKEN THROUGH TOP OF ENCLOSURE.

(*Fig.* 8).

If dimension "D" = 8 in., "P" = —10%.

If dimension "D" = 6 in., "P" = —15%.

If dimension "D" = 5 in., "P" = —20%.

If dimension "D" = 4 in., "P" = —25%.

If dimenison "D" = 3 in., "P" = —33%.

These values of "P" are subject to a variation of 2% either way.

The lengths of the inlet and outlet screens or slots in all types of enclosures, as described above, are to be the same as the lengths of the radiators in the enclosure.

EXAMPLE SHOWING VALUE OF "P."

In order to understand thoroughly the proper application of the foregoing values of "P" for enclosed radiators, let us follow through the example as given below:

Assume that in a certain room (heated by steam), the total heat losses, including allowances for air-leakage and wind exposure, amount to 10,000 B. T. U. One radiator is to be used, of 20-in. 4-col. type, located in a recess similar to that shown in Fig. 5.

The size of the air outlet screen in the top can be made equal to the depth of the radiator, and also the length of screen can be made equal to the length of the radiator. The air inlet consists of a 2-in. high open slot, the same length as the radiator. Then, according to item "B"—of the summary—under "Enclosure with Air Inlet in Front and Air Outlet in Top," the value of "P" in per cent. for this enclosed radiator is, —25%.

From Table 22 we see that "K" = 1.48 B. T. U. given out per square foot per degree difference, for the radiator when not enclosed; with steam at 219°, the total B. T. U. given out per square foot = 220. As the radiator is to be enclosed, as stated above, we must de-

TABLE 28.

HEAT TRANSMISSION COEFFICIENT VALUES (K) FOR STEAM PIPES,- COILS,- AND - RADIATORS.

ALL HEATING SURFACE PAINTED ONE COAT ALUMINUM -		AIR - QUIET. RESIDENCES - OFFICES ETC.			AIR - MOVING - FACTORIES -		
TYPE OF HEATING SURFACE		"K" = B.T.U. PER HOUR PER SQ. FT. PER DEG. F. DIFF.	B.T.U. PER SQ. FT. HEAT. SURF. STEAM = 212° AIR = 70° DIFF. = 142°	B.T.U. PER SQ. FT. HEAT. SURF. 2# STEAM = 217° AIR = 70° DIFF. = 149°	"K" = B.T.U. PER HOUR PER SQ. FT. PER DEG. F. DIFF.	B.T.U. PER SQ. FT. HEAT. SURF. STEAM = 212° AIR = 70° DIFF. = 142°	B.T.U. PER SQ. FT. HEAT. SURF. 2# STEAM = 217° AIR = 70° DIFF. = 149°
STD. PIPE.	INSIDE DIAM.						
SINGLE PIPE HORIZ. OR VERT.	To - 1"	2.66	376	395	2.92	413	435
	1" To 3½	2.46	350	367	2.70	383	402
	3½" + OVER	2.35	333	350	2.58	366	384
PIPE COILS LESS THAN 3'-0" HIGH	To - 1"	2.56	363	380	2.81	400	418
	1" + OVER	2.25	320	335	2.47	350	368
PIPE COILS MORE THAN 3'-0" HIGH	To - 1"	2.25	320	335	2.47	350	368
	1" + OVER	1.95	275	290	2.14	303	318
C. I OR STEEL RADIATORS - PLAIN SURFACE - REG. CENTERS							
32"-HIGH 38"- " 45"- "	1 COL.	1.74	247	259	1.91	271	284
	2 COL.	1.65	234	245	1.81	260	270
	3 COL.	1.40	200	208	1.54	219	229
	4 COL.	1.35	192	201	1.48	211	220
20"-HIGH. 23"- " 26"- "	1 COL.	1.91	271	284	2.10	298	312
	2 COL.	1.81	259	270	2.00	284	298
	3 COL.	1.59	225	237	1.75	248	260
	4 COL.	1.48	211	220	1.62	230	241
14"- HIGH 18"- " WINDOW RAD.	6 COL.	1.35	192	201	1.48	211	220
C. I. WALL RADIATOR.	5" SEC. VERT.	1.92	273	286	2.10	273	312
	5" SEC. HORIZ.	2.10	298	312	2.30	326	342
	7+9" SEC. VERT.	1.70	242	253	1.87	265	278
	7+9" SEC. HORIZ.	1.90	270	283	2.08	295	309

TABLE 29.

HEAT TRANSMISSION COEFFICIENT VALUES (K) FOR HOT WATER PIPES,-COILS,-AND-RADIATORS.

ALL HEAT. SURFACE PAINTED ONE COAT ALUMINUM.		AIR - QUIET. RESIDENCES - OFFICES ETC.			AIR - MOVING. - FACTORIES -		
TYPE OF HEATING SURFACE		"K" = B.T.U. PER HOUR PER SQ. FT. PER DEG. F. DIFF.	B.T.U. PER SQ. FT. HEAT. SURF. AVER. WATER = 185 " AIR = 70° DIFF. = 115°	B.T.U. PER SQ. FT. HEAT. SURF. AVER. WATER = 195 " AIR = 70° DIFF. = 125°	"K" = B.T.U. PER HOUR PER SQ. FT. PER DEG. F. DIFF.	B.T.U. PER SQ. FT. HEAT. SURF. AVER. WATER = 185 " AIR = 70° DIFF. = 115°	B.T.U. PER SQ. FT. HEAT. SURF. AVER. WATER = 195 " AIR = 70° DIFF. = 125°
S'T'D. PIPE	INSIDE DIAM.						
SINGLE PIPE. HORIZONTAL OR VERTICAL	To - 1"	2.46	283	307	2.70	310	337
	1" To 2"	2.15	247	268	2.36	271	295
	2" To 3½	2.15	247	268	2.36	271	295
	3½ To 5"	1.95	223	243	2.14	246	267
	5" & OVER	1.74	200	217	1.91	220	239
PIPE COILS LESS THAN 3'-0" HIGH	To - 1"	2.25	258	281	2.47	284	308
	1" & OVER	1.84	211	230	2.02	232	252
PIPE COILS MORE THAN 3'-0" HIGH	To - 1"	1.95	224	244	2.14	246	267
	1" & OVER	1.64	188	205	1.80	207	225
C. I. OR STEEL RADIATORS - PLAIN SURFACE - REG. CENTERS.							
32"- HIGH 38"- " 45"- "	1 COL.	1.36	156	170	1.49	171	186
	2 COL.	1.30	150	162	1.43	164	178
	3 COL.	1.14	131	142	1.25	144	156
	4 COL.	1.09	125	135	1.20	138	150
20"- HIGH 23"- " 26"- "	1 COL.	1.49	171	186	1.64	188	205
	2 COL.	1.43	164	178	1.57	180	196
	3 COL.	1.25	144	156	1.38	158	172
	4 COL.	1.20	138	150	1.32	152	165
14"- HIGH 18"- " WINDOW RAD.	6 COL	1.09	125	135	1.20	138	150
CAST IRON WALL RADIATORS	5"- SEC. VERT.	1.80	207	225	1.98	228	247
	5"- SEC. HORIZ.	1.98	228	247	2.17	250	271
	7-9" SEC. VERT.	1.60	184	200	1.76	202	220
	7-9" SEC. HORIZ.	1.80	207	225	1.98	228	247

duct 25% from 220, which gives us 165 B. T. U. per square foot as the efficiency of the enclosed radiator.

As the total heat loss for the room equals 10,000 B. T. U., we have 10,000 ÷ 165 = 60 sq. ft. surface.

Instead of obtaining the size of the enclosed radiation by use of reduced heat transmission coefficient "K," we may also make use of value "P" by transforming it into a certain per cent. to be added to the amount of heating surface of radiator when exposed, as follows:

The radiator when not enclosed = 10,000 ÷ 220 = 45 sq. ft. of heating surface.

If this radiator is to be enclosed ("P" = —25%) the actual heat units given off will be only 75% of that required (of the 10,000). As the full 100% is necessary to heat the room, the square feet must be multiplied by 100 ÷ 75, or 1 1/3, therefore 45 × 1 1/3 = 60 sq. ft., if the radiator is enclosed.

In determining the pipe sizes for the radiator the total heating surface can be taken as 45 sq. ft. at an efficiency of 220 B. T. U., or 60 sq. ft. at an efficiency of 165 B. T. U.

It is best, however, to reduce to heat units so as to avoid any confusion due to the use of various coefficients.

Ventilation and Cooling of Halls

SOME PRACTICAL EXAMPLES DEALING WITH LARGE INTERIORS.

Typical examples of European practice in the heating and cooling of large halls are given in a comprehensive paper on this subject by M. Hottinger, consulting engineer for Sulzer Bros., Winterthur, Switzerland, and published in Schweizerische Bauzeitung. The accompanying translation was especially made for THE HEATING AND VENTILATING MAGAZINE.

Figs. 1, 2, 3, 4 and 5, also Figs. 7 and 8 indicate several methods by which air can be displaced if it is introduced colder than the interior air of the hall; that is, if it is a question of cooling to a certain degree and, at the same time, of ventilating the hall. It is assumed in Fig 6, for special reasons, that the incoming air is of the same temperature as that in the hall, while in Fig. 9 the temperature of the incoming air is higher. Where the air is introduced at a higher temperature than that of the hall itself, with the idea of supplying heat, it is evident that air currents will be different from those indicated by the arrows shown in Fig. 6.

In Fig. 1 it is assumed that there are no mouldings, no decorations or other obstacles to impede the air from spreading over the ceiling and also that the air supply and exhaust registers are placed in the side walls.

If the entering air is introduced at an angle to the ceiling, with a velocity of about 9 feet per second, it would tend to adhere to the ceiling, then spread out and drop gradually. This entering velocity of the air could also be employed without the likelihood of producing a noise. In this case it will be noted that the air is exhausted near the floor, an arrangement that makes it easy to keep

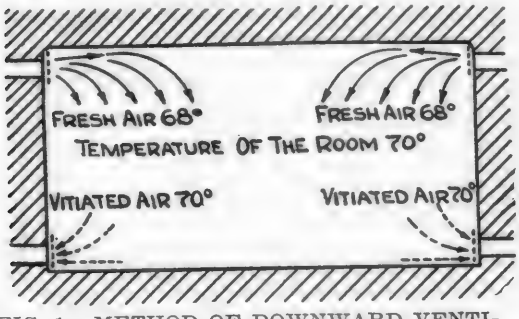


FIG. 1.—METHOD OF DOWNWARD VENTILATION FREQUENTLY EMPLOYED.

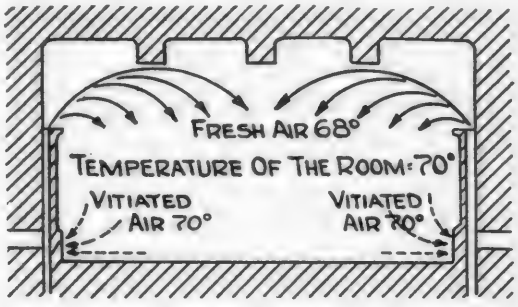


FIG. 2.—SCHEME OF DOWNWARD VENTILATION WHERE OBSTACLES IMPEDE AIR FROM SPREADING OVER CEILING.

the interior warm. If we desire to use ceiling air exhausts, designed to be opened when it is desired to exhaust warm air, the arrangement shown in Fig. 8 may be adopted. In this case it will be seen that all of the vitiated air is taken out at the ceiling.

Sometimes, however, on account of obstacles along the ceiling, as indicated in Fig. 2, the incoming air cannot spread sufficiently along the ceiling and if, besides, the air must be introduced and taken out through the side walls, it is better to supply this air at a slightly lower level, but vertically and not horizontally as shown in Fig. 2. This arrangement can be easily carried out if, for example, the walls are covered with a wainscoting of sufficient height so that

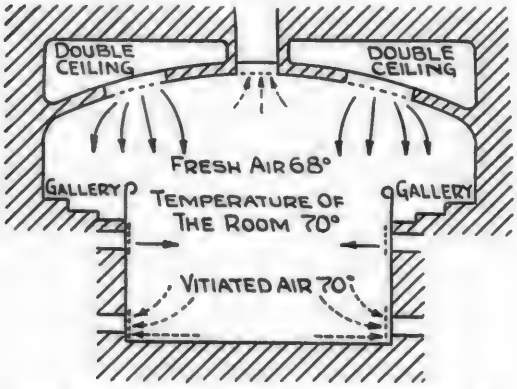


FIG. 3.—EFFECTIVE ARRANGEMENT FOR DOWNWARD VENTILATION, WITH AIR SUPPLY AT CEILING.

the air can be made to rise between the wainscoting and the wall. In such a case care must be taken to provide for cleaning.

The acquired velocity tends to cause the air to rise, although its density, which is greater than that of the interior air, tends to cause it to descend. Thus the resultant direction of the air currents, as shown in Fig. 2, are those which are the result of these forces.

To aid the air movement in the hall it has been tried, in certain cases, to place openings with dampers near the floor and in the vertical ducts, intended to act as injectors in which the interior air is drawn by the current of fresh air.

Where possible, the best arrangement consists in providing an air supply at the top of the hall, properly located and having, if necessary, a double ceiling

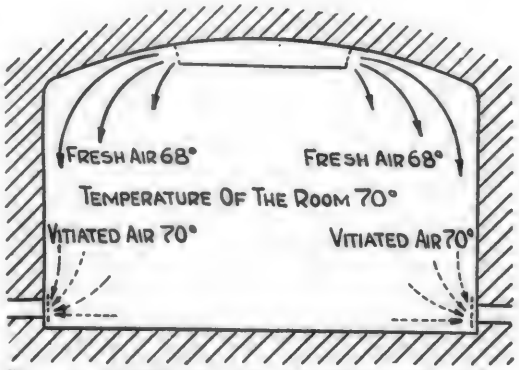


FIG. 4.—METHOD OF DOWNWARD VENTILATION, RESULTING IN CURRENTS ALONG WALLS.

(Fig. 3). Such an arrangement permits the spreading of the air over large surfaces and causes it to traverse the ceiling at a low velocity. However, if we have only a small number of places for the introduction of air and, in consequence, the velocity has to be high, it is preferable to carry the air duct across the ceiling, using large decorative surfaces underneath the ducts as shown in Fig. 4. The air may now be made to flow out horizontally so that the air particles will spread along the surface of the ceiling, losing through friction a part of its velocity and in this way preventing the air currents from descending at too high a velocity and thus produce drafts. However, by referring to Fig. 4, it will be seen that there will be some air currents in the neighborhood of the walls, since the air descends along the walls.

When the ceiling of the hall is relatively low, an arrangement may be fol-

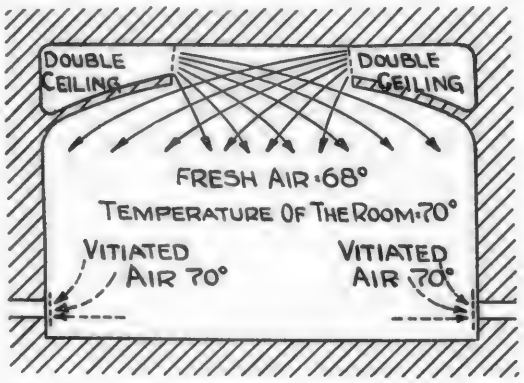


FIG. 5.—GOOD METHOD OF DOWNWARD VENTILATION, WITH NO RESULTANT AIR DRAFTS ALONG WALLS, IN SPITE OF RATHER LOW CEILING.

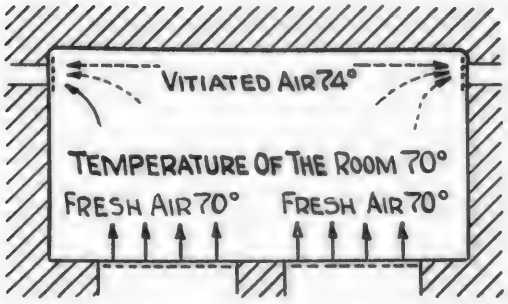


FIG. 6.—UPWARD VENTILATION, THE SEATS BEING FIXED TO THE FLOOR.

lowed similar to that shown in Fig. 5, and in this case there will be no air currents, even if the entering air has a velocity of as much as 6 ft. per second.

When the air must be introduced into the hall near the floor, it is better, in most cases, to have the air openings in the side walls and as near the floor as possible. An arrangement such as that shown in Fig. 6 should be adopted except when the seats are fixed to the floor, such as would be the case in theatres, large lecture halls, etc. But even where this is done, we should not place the air supply registers in such a manner that dirt from shoes or sweepings can fall into the air ducts. The registers should be placed vertically against the seats or, at least, some protection provided against the admission of dust. It is recommended that dampers be used to regulate the air supply through each register as well as its velocity. It would be better practice to place the exhaust registers in the floor, as shown in Fig. 7, but here again it is necessary to keep in mind the protection of the ducts from dust.

Fig. 8 represents a method of ventilation, with supply and exhaust near the ceiling, while Fig. 9 shows the arrangement where the supply and exhaust ducts are near the floor. The installation shown in Fig. 8 is to be recommended particularly in cases where, the interior being high and having large areas of high heat transmission, it becomes necessary to make use of the ventilation system to supply heat by circulation.

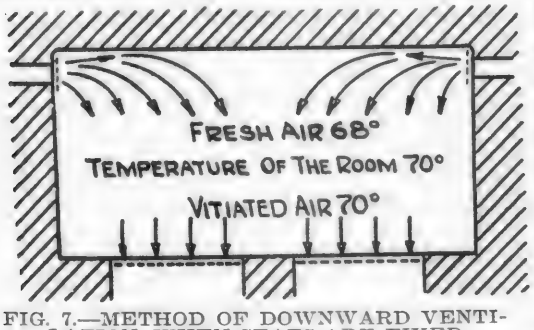


FIG. 7.—METHOD OF DOWNWARD VENTILATION, WHEN SEATS ARE FIXED TO FLOOR.

In interiors of large dimensions, the supply and exhaust ducts are often omitted, warm air is compressed slightly in the interior by means of fans and the exhaust air is left to flow out at points that are not air tight. Where this method is followed it is not possible to indicate in a definite manner the direction and location of the air currents, as they depend upon the leakage points, the outside wind and other factors.

It can be said that in winter the greater portion of the interior air will be exhausted from the upper part of the room, on account of the rise of the warm air;

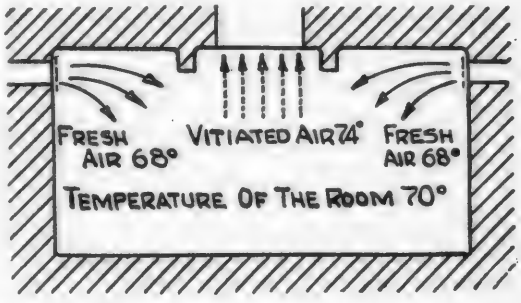


FIG. 8.—UPWARD VENTILATION REQUIRING THE MAXIMUM AMOUNT OF AIR.

in fact, it is at the upper level that the excess pressure between the interior and exterior air will be greatest.

In cases of this kind, fresh air should be allowed to enter at a lower level. Where the supply and exhaust registers are as close as represented in Figs. 8 and 9, it should be kept in mind that it is necessary to admit the fresh air at a reasonable temperature. In the case of Fig. 8, this air must be cooler than the exhaust air, whereas in Fig. 9, it should be warmer, otherwise the supply air would be exhausted immediately without moving across the interior.

METHOD FOR REMOVING TOBACCO SMOKE.

The method devised by Prof. Rietschel, which is especially adapted to remove tobacco smoke from halls having large areas is shown diagrammatically in

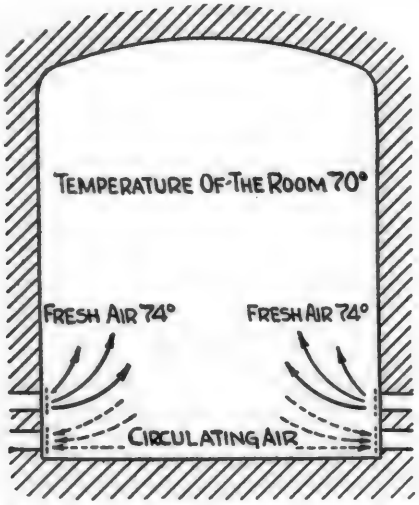


FIG. 9.–DOWNWARD VENTILATION WHICH CAN BE UTILIZED, IF NECESSARY, TO HEAT THE INTERIOR.

Fig. 10. This idea has been used recently with great success. The most important feature of the method is the introduction of the air at a height of about 6 to 9 ft. above the floor, the air having a rather high velocity and a temperature about 9 degrees higher than the temperature of the room.

The introduction of this air serves to produce an upward movement of the

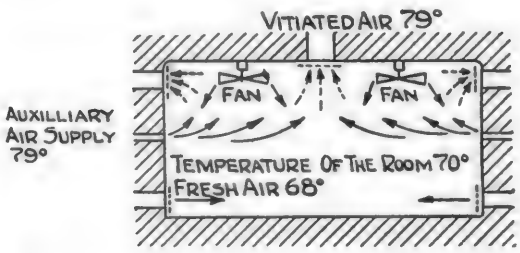


FIG. 10.—METHOD OF UPWARD VENTILATION FOR A RESTAURANT, ESPECIALLY IN CLEARING INTERIOR OF TOBACCO SMOKE.

tobacco smoke. Rietschel was guided in his judgment by considering that the tobacco smoke is composed mainly of finely-divided ashes at the temperature of exhaled smoke (about 95 degrees F.). This mixture, as it starts to rise, is gradually cooled and remains in suspension in the air, forming a blue cloud. The introduction of the warm air gives it a new ascending impulse which raises it towards the ceiling. This ascending action is favored by a normal upward ventilation. The ceiling fans shown in the diagram (Fig. 10) intimately mix the different parts of the air in the room and thus no part of the room will remain unaffected by the ventilation.

Heating and Ventilation Laws and Regulations in the United States

REQUIREMENTS OF RECENTLY-ENACTED AND OTHER LAWS NOW ON THE STATUTE BOOKS IN THE VARIOUS STATES.

III

Ohio—(Continued).

REQUIREMENTS OF THE DEPARTMENT OF INSPECTION OF THE INDUSTRIAL COMMISSION OF OHIO FOR THE HEATING AND VENTILATION OF PUBLIC BUILDINGS, HOSPITALS, ASYLUMS AND HOMES.

Change of Air.

The heating system shall be combined with a system of ventilation which at normal temperature will change the air the following number of times or supply to each person the following number of cubic feet of air per hour:

Asylums, Hospitals and Homes.

Rooms with fixed capacity.

	Adult	*Children*	*Babies*
Hospitals, contagious and epidemic	6,000	4,000	3,000
Hospitals, surgical and medical	3,000	2,400	1,500
Penal Institutions ...	1,800	1,800	....
All other buildings ...	1,800	1,500	....

Rooms with variable capacities.

Hospitals, epidemic and contagious	12 times per hour
Hospitals, surgical and medical	12 times per hour
All other buildings	6 times per hour

Rooms accommodating four or less persons need not be provided with a system of ventilation.

Radiators.

No radiator shall be placed in any aisle, foyer or passageway of a new theatre, assembly hall or church, but such radiators may be placed in recesses in the walls.

Registers.

No floor registers shall be used in theaters, assembly halls, or hospitals.

No floor registers, except foot warmers, shall be used in a school building.

Floor registers may be used in churches.

Otherwise all vent registers shall be placed not more than 2 in. above the floor line, and warm air registers not less than 8 ft. above the floor line (except when such registers are used when a change of air is not prescribed).

Systems to be Installed Where a Change of Air Is Required.

The system to be installed when a change of air is required shall be either a gravity or mechanical furnace system, gravity indirect steam or hot water system; mechanical indirect steam or hot water system, or split steam or hot water system, except in hospitals where a direct indirect system may be used in connection with an exhaust fan.

The fresh air supply shall be taken from outside the building and no vitiated air shall be reheated.

All vitiated air shall be conducted through flues or ducts and be discharged above the roof of the building.

Exceptions.

Standard ventilating stoves may be used in the following buildings:

Assembly halls seating less than 100 persons.

Churches seating less than 100 persons.

All school buildings, hospitals, asylums and homes.

Furnaces.

Furnaces may be used in all classes of buildings.

Gravity Indirect Hot Water or Steam Radiator System.

Indirect hot water or steam radiators shall be located in basement fresh air rooms dirently at the base of masonry hot air flues, and shall be properly connected to same with galvanized iron housing.

Indirect Radiating Surface for Heating and for Ventilating Purposes.

One square foot of radiating surface shall be provided to heat not more than the following number of cubic feet of air per hour.

Height.	*Steam.*	*Hot water.*
First story	200	125
Second story	250	160
Third story	300	200
Fourth story	250	235

For Heating Wall and Glass Surfaces.

The amount of radiating surface for the heating of the glass and wall surface shall not be less than that obtained by adding together the glass surface and one-fourth the exposed wall surface, both in square feet, and multiplying by the following factors:

Height.	*Steam.*	*Hot water.*
First story	0.7	1.05
Second story	0.6	0.9
Third story	0.5	0.75
Fourth story	0.4	0.5

Accelerating Coils for Vent Flues.

Vent flues used in connection with a gravity indirect steam or hot water system shall be provided with accelerating coils placed 1 ft. above the vent openings.

Mechanical Fan Plenum System.

This system shall be so designed with furnaces or tempering coils and blast coils to furnish heated air, to have cleaning screens, fan plenum chamber, galvanized iron or masonry horizontal ducts, masonry hot air flues, electric motor, gas or gasoline engine, or a low pressure steam engine operating on a steam pressure not to exceed 35 lbs. to operate fan and such other device as is necessary to make this a complete working system. All parts and apparatus in connection with system, to be of ample size to make a perfectly free and easy working system, and to thoroughly heat all portions of the building without forcing.

Velocity of Air.

The velocity of the air traveling through ducts, flues, etc., shall never exceed the following number of feet per minute:

Ducts, Flues, Etc.	*Feet per minute.*
Fresh air screens (small mesh)	600
Fresh air ducts, gravity system	300
Fresh air ducts, mechanical system	850
Tempering coils, gravity system	300
Tempering coils, mechanical system	1,000
Furnaces, gravity system	400
Furnaces, mechanical system	900
Trunk ducts, mechanical system	1,000
Laterals, branches and sigle ducts, mechanical system	750
Vertical flues, mechanical system	500
Vertical warm air flues, gravity system, first story	300
Vertical warm air flues, gravity system, second story	350
Vertical warm air flues, gravity system, third story	390

Vertical vent flues less than 20 feet high	300
Vertical vent flues 20 to 33 ft. high	350
Vertical vent flues 33 to 46 ft. high	390
Vertical vent flues 46 to 60 ft. high	440
Warm air registers	300
Vent registers	300

For flues, ducts, etc., used in connection with stoves, see pamphlet on standard ventilating stoves.

Maximum Speed of Fans.

The maximum speed of fans used in connection with either an exhaust or plenum system of heating or ventilating, under normal conditions shall never exceed the following:

Diameter of fan in inches.	*Revolutions per minute.*
18	700
24	550
36	400
48	300
60	225
72	175
96	150
120	125
180	75

Location of Heater Room.

No heater room shall be located under the auditorium, stage, lobby, passageway, stairway or exit of a theater; nor, under any exit, passageway, public hall or lobby of an assembly hall, church, school building, asylum, hospital or home. This applies to new buildings, and a changed location of a heater room in an existing building.

Standard Fireproof Heater Room for New Buildings.

All furnaces and boilers, including the breeching, fuel rooms and firing spaces, shall be enclosed by brick walls not less than 12 ins. thick, or by monolithic concrete walls not less than 8 ins. thick; and the ceiling over the same shall not be less than the following, reinforced concrete slab 4 ins. thick, brick arches 4 ins. thick covered with one inch of cement mortar and supported by fireproof steel with the necessary tie rods, or by hollow tile arches 6 ins. thick covered with 2 ins. of concrete, plastered on the under side and supported by fireproof steel with the necessary tie rods.

All openings in the above apartments from the other parts of the building shall be covered by standard self-closing fire doors.

Heater Rooms for Old Buildings.

In old buildings, the boiler or furnace and fuel rooms, shall be enclosed in same masonry walls and shall have standard fire doors on opening to same, and the entire ceiling shall be fireproofed as follows: First overlay the entire ceiling with ¼-in. asbestos board, lapped at least 1½-ins. at joints, then furr same with 1½ ins. high metal furring spaced 12 ins. on centers; then lath with metal lath and heavily plaster with asbestos and Portland cement plaster.

CLEVELAND.

A new building code is effective in Cleveland, Ohio (October 14, 1913), known as Ordinance No. 29,798, which amends and supplements Section 196 of the revised ordinances of 1907. The heating and ventilating sections of this code are published in a separate booklet, prepared by Virgil D. Allen, inspector of buildings; E. W. Cunningham, assistant inspector of buildings, and T. R. Quay, engineer of heating and ventilation for the City of Cleveland. The principal sections of this code are as follows:

(a) *Plan Examination.*—Before issuing a permit for the erection, alteration, or enlargement of any building or structure, the plans and specifications of which show that heating and ventilating work is to be installed therein, the Inspector of Buildings shall cause the plans and specifications thereof to be submitted to the Heating and Ventilating Engineer, and shall not issue a permit therefor until the said Heating and Ventilating Engineer shall have certified in writing that such plans and specifications provide for compliance with the ordinances relating to heating and ventilating.

(b) *Inspection.*—The Heating and Ventilating Engineer shall inspect or cause to be inspected all heating and ventilating work as it progresses as required by ordinances relating thereto.

(c) He shall examine dangerous conditions, etc., and report to inspector of buildings. Buildings may be closed and the owner fined for failure to comply with instructions of inspector of buildings.

196-2 takes up permits and notice of starting work. Heating and ventilating permits are required.

Descriptions of the various heating and ventilating systems are contained in Section 196-4. These include the mechanical plenum steam or hot water system, combined plenum and direct steam or hot water system, mechanical furnace system, direct heating system, gravity indirect steam or hot water system, mechanical system of exhaust ventilation, gravity system of exhaust ventilation.

Ventilation Requirements.

Ventilation. (a) *Theatres, Assembly Halls, Etc.*—Every hall, auditorium or room of every building hereafter erected or converted to use as a school house, theatre, or place of public assembly or entertainment, shall have in continuous operation, while occupied, a system of ventilation so designed and installed as to pro-

vide not less than 25 cu. ft. of outer air per minute for each person for whom seating accommodation is provided.

(b) *Retail Department Stores.*—Every building hereafter erected for, or converted to use as a retail department store, shall have in operation, while occupied, a mechanical system of ventilation so designed and installed as to provide at least the following number of complete air changes per hour:

Basements used for retailing merchandise, or for locker rooms, rest rooms, or such other rooms as are required by ordinance to be ventilated, six changes per hour.

Ground or first floor, six changes per hour. Floors above the first floor four changes per hour, unless natural ventilation is provided as required by the Ordinances of the City of Cleveland, and maintained while occupied.

(c) *Restaurant Kitchens.*—Every building or part thereof hereafter erected for, or converted to use as a restaurant, lunch room or kitchen for same, shall have in operation, while occupied, a mechanical system of exhaust ventilation so designed and installed as to exhaust the air of the entire kitchen at least six times per hour, if the kitchen and restaurant or lunch room are separate; if not separate six changes will be required for the entire restaurant or lunch room and its kitchen.

(d) *Factories and Workshops. — Every* building, room or part thereof herafter erected for, or converted to use as a factory or workshop, in which there shall be less than 20 sq. ft. of floor space for each employee or occupant, shall have in operation, while occupied, a mechanical system of ventilation so designed and installed as to provide at least six complete air changes per hour.

Unless natural ventilation is provided as required by the Ordinances of the City of Cleveland, and maintained while occupied, every factory, in which there is more than 20 sq. ft. of floor space for each employee or occupant, shall have in operation, while occupied, a system of ventilation so designed and installed as to provide at least four complete air changes per hour.

(e) *Hospitals, Detention Buildings, Etc.* — Every building hereafter erected or altered for use as a hospital for housing the sick, infirm, imbeciles, or children, and also every jail, police station, asylum, house of correction and detention, and also every home for the aged and decrepit, where sleeping accommodations are provided for more than ten persons, shall be provided with a system of ventilation so designed and installed as to provide not less than six complete changes of air per hour in the dormitories, cell blocks, wards, public sitting rooms, toilet rooms, and any other rooms, or parts of such buildings where the inmates may congregate, except as hereinafter provided.

(f) *Churches.*—In every building hereafter erected for, or converted to use as a church, the auditorium, where such auditorium has a seating capacity in excess of 300, or where the clear story height is less than 15 ft., shall have in operation, while occupied, a mechanical system of ventilation so designed and installed as to provide not less than six complete air changes per hour.

If the seating capacity of any auditorium is 200 or less, or if the clear story height is 15 ft. or more, a modified system of ventilation, which shall meet the approval of the Heating and Ventilating Engineer, may be installed.

(g) *Carbon Dioxide Tests—New Buildings.* —The amount of carbon dioxide in the air of any building or part thereof, hereinbefore mentioned in this section, shall not be permitted to rise above 10 parts of carbon dioxide per 10,000 parts of air.

(h) *Carbon Dioxide Tests—Existing Buildings.*—The amount of carbon dioxide in the air of any building or part thereof, erected prior to the passage of this ordinance, shall not be permitted to rise above 12 parts of carbon dioxide per 10,000 parts of air.

Where this percentage of carbon dioxide is exceeded the inspector of buildings is empowered to require additional ventilation. There are some exceptions to this ruling, such as storage rooms and vaults, and places where the manufacturing process would be materially interfered with.

Under (k) cellar or basement air is prohibited for ventilating purposes.

The ventilation of toilet rooms and fixtures is covered in 196-6. Separate systems are required, with six air changes per hour.

Section 196-7 takes up circulation and temperature of air. The fresh air supply must be taken from outside the building from a source approved by the heating and ventilating engineer and no vitiated air shall be reheated. Vitiated air is to be carried to the roof of the building and there discharged.

(c) *Prohibited Location of Fresh Air Openings.*—No opening for fresh air supply shall be placed within 50 ft. of any tight cesspool, manure pit, or septic tank; within 100 ft. of any leeching cesspool or filtration bed; within 500 ft. of any garbage disposal or fertilizer plant.

(d) *Prohibited Means of Conducting Air.*— No vent, fresh air, or warm air duct shall be constructed of wood, nor shall any vitiated air, fresh air, or warm air be conducted through void spaces, stud walls, furring or stripped floor construction.

(e) *Separate Vent Ducts and Exceptions.*— No vent or flue shall serve more than one room, except where a mechanical system is used, and the connections between ducts or flues are above the topmost or below the lowermost floor which the system is intended to serve.

(To be continued.)

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A THOUGHT that has long been in the minds of many engineers was expressed recently in the statement that "the day is coming when the engineer will occupy the position now held by the architect." The speaker went on to say that the public or office building is primarily an engineering problem in which the architect "farms out" 75% of the work. Moreover, this percentage is constantly increasing. The speaker therefore took the ground that the design of such buildings really belongs to the engineer who should be in charge and, if necessary, "farm out" the architecture. It is easy to see how this proposition will strike the architects, yet its accomplishment is not such a remote possibility as might be imagined. In more than one engineering office at the present time there is maintained a distinct "architectural" department, so that the office which is primarily that of a designing engineer for heating, ventilating, electrical and sanitary equipment, is at the same time fully prepared to handle the other structural features, including the architecture.

WITH the arrival of the convention season heating engineers in the East are congratulating themselves over the fact that practically all of the larger meetings will be held at points within comparatively easy access. All of the four conventions of the trades they are most interested in will be held, with one exception, east of Pittsburgh. The exception is the summer meeting of the heating engineers in Cleveland. The National District Heating Association will lead off with its sixth annual meeting in Rochester, N. Y., May 26-29. The program of this meeting, which will be found on another page, indicates the treat in store not only for central station men, but for heating engineers generally. This meeting will be quickly followed by the convention of the National Association of Master Steam and Hot Water Fitters, at Atlantic City, N. J., June 10-13. Almost directly following the master fitters' convention, at the same resort, July 16-18, will be the convention of the National Association of Master Plumbers, which often has much to interest the heating man. Finally the midsummer meeting of The American Socity of Heating and Ventilating Engineers will go on in Cleveland, O., July 9-11.

NEXT month THE HEATING AND VENTILATING MAGAZINE will be ten years old. We shall celebrate the occasion by publishing a Tenth Anniversary Number which, we may say, will be one worthy of the occasion and of the field we represent. The June issue will contain upwards of twice the usual amount of reading matter and the contributors will include men of national prominence in the heating profession.

THE CONSULTING ENGINEER

"The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

29—The Ventilation of Small Public Buildings.

QUESTION: Is it ever advisable to use a gravity system of ventilation in a school building? We have in mind several grade and small high school buildings in small towns. As these towns do not have electric light plants, it is necessary to install low pressure engines and pumps which are easy to operate.

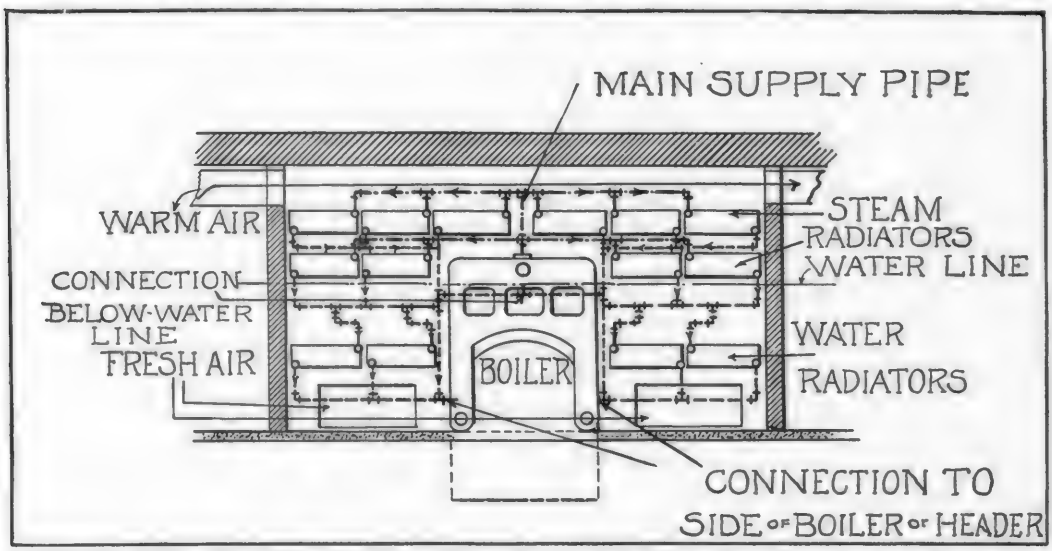
ANSWER: It is feasible to install plants with gravity circulation for the air supply and many schools have been so designed in the past. There is always an uncertainty of results in moderate damp weather when little heating is necessary and the regular supply of fresh air is required. For the best results under all conditions, mechanical ventilation should be provided for all schools, both large and small. Each class room should be provided with a minimum of 30 cu. ft. of air per minute per pupil, heated to 65° to 70° F., and the same amount should be exhausted with an exhaust fan.

The rooms should be heated by direct radiation independently, and thermostatically controlled. This arrangement is mainly for economical operation as the air supply is only required for about 1,000 hours while the building should be kept warm for 3,200 hours when no ventilation is required. (New York District).

The medium for heating may be hot water forced circulation, steam at low pressure gravity return, or with boilers operated at a higher pressure, with steam at reduced pressure for heating through a reducing valve. Any modification of the above is for the purpose of reducing the initial cost or eliminating the licensed operatives.

When outside current is available at moderate cost, the solution of the problem is simplified for small schools of under ten rooms as electric motors may be used. In small installations as above described, many modifications may be made in the design of the system that would prevent the best economy in operation if applied to larger buildings. The direct radiation may be omitted and the building heated entirely by indirect in small installations without affecting the operating cost to the same extent as in larger schools.

The exhaust ventilation is frequently accomplished by means of aspirating coils in the vent flues, thus eliminating the exhaust fan. This is a very wasteful and inefficient



SCHEME FOR GRAVITY VENTILATION IN CONNECTION WITH A STEAM HEATING SYSTEM.

method especially in large installations, but is cheap. It would, however, accomplish the object with less waste in a small building.

If a gravity system of steam with no power were absolutely obligatory for a small building, the air supply could be taken from a central point and a cast-iron boiler provided with a stack of radiators above the water line for steam and one below the water line for water along the side of the boiler, and the whole enclosed in a brick chamber (as per Fig. 1). Horizontal ducts would lead from the space above the indirect stack to the individual rooms. The indirect stack should be large enough to heat all incoming air to 70° and vertical flues should be large enough so that the velocity would be less than 400 ft. per minute. A separate system of direct radiation could then be provided in the individual rooms, thermostatically controlled, to heat the rooms during non sessions when the air supply could be shut off, the same boiler providing the steam.

If one hot water stack were used and two steam stacks, the thermostat regulating the air temperature could control the valve, in the return from each stack, so that the water of condensation would rise, regulating the temperature of the incoming air as the surface was covered with water.

If no power were available, and mechanical ventilation and positive results were desired, a small generating set could be installed operated by gasoline, acetylene, kerosene or other illuminating gas. The gas generator could be placed in a vault without the building and the power question overcome in compliance with the insurance requirements. Gravity steam coils could be used for heating as above described and supply and exhaust fans operated by motor. The lighting of the building could be accomplished at such times as required with the same apparatus.

Gas plants and generating sets of this character are widely used for isolated private houses to furnish lighting and power and are not excessive in cost. They are, however, in many cases designed for low voltage. Automobile and motor boat engines can be obtained that will operate on such fuel gas with slight modification, and are of high efficiency, noiseless and admirably adapted to operate generators for electric current.

The use of low pressure engines is obsolete. Its purpose was to eliminate the licensed engineer which, in the writer's opinion, is a mistake. Engines of this type are large, cumbersome, expensive and wasteful, due to the low steam pressure. The writer fails to see wherein their adoption simplifies the operation of the plant or decreases the risk or danger.

Greater economy would be obtained in a plant of any size by operating the boilers at higher pressure for the engine and utilizing the exhaust steam and steam at reduced pressure on the heating. The saving in coal due to intelligent firing would more than make up any difference in wages of the licensed over the unlicensed engineer. It is the writer's opinion that operators with the requisite experience to operate either type of plant economically will require about the same compensation whether licensed or not.

In large schools of twenty-five rooms or over, it will pay to install an isolated plant for power if current from the outside costs 5 cents per kilowatt hour or over. Several large schools in the East are heated by hot water forced circulation and isolated plants are provided for power, operated in conjunction with the heating system.

A live steam heater is placed above the high pressure boilers with a gravity return, to heat the circulated water. The fans are all operated by motors, the fresh air heated by a hot water indirect stack, and the exhaust steam from the generating unit is all utilized for heating. The ability to vary the temperature of the entire heating medium rapidly and through a wide range to meet outside weather conditions makes the system very economical. Pipes are much smaller, covering is unnecessary outside of the engine room and all trench work is eliminated as the circulation is independent of gravity.

In a plant of any size the first cost is less or about the same as for the low pressure steam if the designing engineer understands this class of work.

31.—Water as a Heat Conveyor.

QUESTION: I have come across an item stating that more heat is required to raise the temperature of a given weight of water 1° than for any other substance, and that this quality of absorbing heat slowly, holding and carrying heat without too much loss makes it possible as a heating medium. The explanation is, as I remember it, that under present conditions it requires a large amount of heat to raise the temperature of water from the freezing point to the boiling point and nearly 5.4 times as much more to change the water into steam. In this way the water is kept in a liquid condition for a considerable time, even under unfavorable conditions, otherwise fires could not be extinguished by water, since the water would in many cases be turned into steam before it could reach the fire.

It was also stated that while water is a very poor conductor of heat it has a great capacity for carrying off heat when in motion. To put it another way, water

at rest is a poor conductor of heat, while water in motion has a tremendous capacity for carrying off heat. The reason given for this is that the small molecules next to the source of heat take up the heat very rapidly, but they do not pass on the heat to the next layer of molecules, hence the desirability of a rapid circulation within a boiler for the purpose of absorbing the highest possible percentage of the products of combustion.

ANSWER: It is, of course, true that water has the greatest specific heat of all substances and is taken as the standard as 1. The rate of absorption depends entirely on the transmission and difference in temperature between the water and the source from which the heat is absorbed. Therefore it may be slow or rapid; the water has little to do with it. However, due to the fact that more B.T.U. will be absorbed per degree rise in temperature, the rate will be maintained longer, due to the slow rise in temperature of the water. The rate of absorption will be more rapid rather than slower.

The reason there are fewer losses in transmission is because the temperature is lowered a fewer number of degrees for a given loss in radiation in the mains in B.T.U. For the same size main and a like difference in temperature, with the same insulation, there would be no difference in the transmission loss. The capacities depend on the specific heat and density, and also the final temperature depends on the same quantities. Great density of the medium means smaller mains and less radiation, while low density and low specific heat mean large mains and more square feet area, also a greater drop in temperature for the los sin B.T.U.

It takes 180 B.T.U. to raise 1 lb. of water from 32 to 212° and 970 (latent heat) ÷ 180 = 5.4 times this amount of heat to turn water into steam. It is quite correct to say that water is a poor conductor of heat. The molecules in water do not pass the heat to the next molecules, but they get out of the way themselves due to their reduced weight and permit the colder molecules a chance to become heated. The result is much the same when the particles move, due to a decrease in weight and an increase in temperature, as if the heat were transferred by conduction.

United States Steel Company's Exhibit at San Francisco.

Announcement is made that the United States Steel Corporation and its subsidiary companies propose to have a comprehensive exhibit of its operations at the Panama-Pacific Exposition in San Francisco in 1915.

ELBERT HUBBARD ON TRADE PAPERS.

VIII.

(*This series of articles commenced in the September,* 1913, *issue.*)

It is a somewhat curious fact that in many daily newspapers a wide gulf exists between the reader and the advertiser.

The newspaper may advertise clairvoyants, fortune tellers, palmists, astrologers, fake remedies, and fraudulent financial schemes, and the subscriber does not wink an eyebrow.

But let a Trade Paper advertise a machine of problematic value, and the editor would have the subscribers right on his back.

It is assumed by the readers of a Trade Paper, that the editor knows every advertiser and is familiar with his products. If not, he should be, and as a matter of fact, he is.

And this confidence of the subscriber has a deal to do with holding the editor to his task.

A great many magazines publish anything that "listens good," and the publisher hopes it is all right. If it isn't all right, he doesn't want to know about it, and isn't thankful when he is told.

With the Trade Paper, the editor cannot countenance "explosives" in his ads. If he does he loses subscribers and if he hasn't subscribers he cannot expect advertisements.

And without advertisements he cannot produce the best paper.

For advertisements not only bring the money that buys gasoline, but the subscriber prizes the Trade Paper on account of the fact that it advertises the machinery, and the goods he needs, and also tells the truth about them.

It will thus be seen that editor, advertiser, and subscriber, occupy a close triangular family relation.

Their interests are mutual. If the Trade Paper did not help the subscriber up the incline plane towards success, it would not and could not exist.

"Each for all, and all for each," is fast becoming the universal slogan. "From every man according to his ability, to every man according to his need," is the new evangel.

There is no such thing as distinct interests, apart from each other.

The manufacturer needs the miner, the miner the manufacturer; they both need the farmer, and we need them all.

One may be a hewer of wood or a drawer of water, another a captain of an

industry. One may be a toiler in the valley, and still another in the observatory on the mountain top, reading the signs of the times. But their success hangs upon their co-operation—their reciprocity—their interrelation.

True progress is only possible where there is mutuality and co-operation—where we see the seeming paradox of individual liberty harnessed to the car of common weal.

The principle of alternating motion is as applicable to the life of the individual as it is to mechanics.

We grow by giving. Power comes from knowledge. Knowledge is absorption and ejection—taking in and giving out. It is a process of interaction.

Thus we get to know each other, to understand the differences of individual, inimical, and communal interests—to have confidence and to combine.

This is the foundation principle upon which we raise the structure of social and commercial prosperity.

Business is now done right out in the sunlight. Publicity is the salvation of both dealer and consumer.

The buccaneer is banished from business.

I have said that we are breaking away from distrust of our fellows. That is true; but we still find people whom it is a task to induce to believe this.

The vast majority of people, though, see that the man who advertises his commodities or service as "quality" must produce them—else his successful days are numbered. And if he provides products that fill the bill, then he and they benefit.

No Trade Paper will publish punk publicity.

The Trade Paper is a publication wherein can be found ideas, plans and information.

The reason is that its subscribers are alert and progressive—alive to their possibilities and to the good things in the world of science and invention.

I know no better medium for the exchange of ideas than the Trade Paper.

Its pages bristle with interesting facts, and pulse with intense humanism and understanding.

The task of the advertiser in the Trade Paper is made a pleasant one by reason of the intelligent receptivity of the subscriber.

The subscriber and advertiser recognize the benefit of business reciprocity, and fully appreciate the friendship based upon it.

They know each other's needs—that they need each other for their individual growth.

They acknowledge the distinct service to each other.

Whether you call this sentiment or something else, yet it is the very essence of success, producing results otherwise unattainable.

The Trade Paper has made giant strides. Its intimacy and strength with its subscribers and contributors is remarkable. But its greatest achievement, to my mind, is the creation of a bond of sympathy, mutuality and understanding between its subscribers and advertisers that is unique.

And we do business with our friends—our enemies will not trade with us, anyway.

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LEGAL DECISIONS

Implied Warranty of Heating Plant—Sale Under Patent or Trade Name—Enforcement of Lien.

Action was brought to enforce a mechanic's lien arising out of a contract for the installation of a steam-heating plant in a skating rink. The boiler to be installed under the contract was "1-5-28 5-section Ideal sectional boiler." The defendant did not deny that a boiler of that size, type, and name was installed by the petitioner, and that the other materials and the amount of labor specified in the contract were furnished by the petitioner. In the (Rhode Island) superior court the defendant claimed that the lien should not be enforced, as the steam-heating plant in question was entirely inadequate for the purpose of properly heating the skating rink. This was not denied by the petitioner, and the petitioner's expert witness testified that the boiler installed was insufficient for the service required, and was two sizes too small. The testimony of the parties, admitted and considered by the superior court, as to the circumstances surrounding the making of the contract, was contradictory; but, although denied by the petitioner, the court found that the defendant was without experience to assist him in the selection of a suitable boiler, that he relied entirely upon the knowledge and skill of the petitioner in making the contract, and that this was known to the petitioner. From these circumstances, the court held that there was a warranty implied in law that the boiler and the steam-heating plant in question should be suitable for the purposes for which it was installed, that there

had been a breach of this implied warranty, and that the petition should be dismissed.

On appeal, it was found that in the lower court certain statutory provisions with regard to implied warranties appeared to have been overlooked. Rhode Island Gen. Laws, 1909, tit. 27, c. 261, § 15, among other things, provides as follows: "(1) Where the buyer, expressly or by implication, makes known to the seller the particular purpose for which the goods are required, and it appears that the buyer relies on the seller's skill or judgment (whether he be the grower or manufacturer or not), there is an implied warranty that the goods shall be reasonably fit for such purpose. . . . (4) In the case of a contract to sell or a sale of a specified article under its patent or other trade name, there is no implied warranty as to its fitness for any particular purpose."

The boiler provided for in the contract, the insufficiency of which appeared, without dispute, to have caused the condition complained of by the defendant, was sold under its trade-name "1-5-28 5-section Ideal sectional boiler." The question was whether the parties should be governed by the paragraph numbered (1) or the paragraph numbered (4) in said section. This section is nearly identical with similar provisions of the English "Sale of Goods Act," 1893, except that in the English statute the two paragraphs are combined, paragraph (4) appearing as a qualification of paragraph (1). Under the English act it would be clear that, in the circumstances, there would be no implied warranty of the fitness of the boiler for the particular purpose for which it was to be installed.

The legal effect of these provisions as they are placed in the Rhode Island statute, so far as they relate to the circumstances of the present case, are not so plain. However, it was held that, notwithstanding the language of paragraph (1), in view of the positive and unqualified prohibition of implied warranty contained in paragraph (4), that paragraph (4), in its bearing on the case, amounted to a proviso, limiting the provisions of paragraph (1). The decree of the superior court was, therefore, reversed and the lien of the petitioner was enforced.—Matteson vs. Lagace, Rhode Island Supreme Court, 89 Alt. 713.

Installing Plant—Safe Working Place—Reasonable Anticipation of Danger.

A corporation contracted to install a refrigerating plant for a packing company. It sent its superintendent to do the work. He employed a steam fitter's helper in the employ of the packing company to assist. The helper was injured while doing the work and sued the contractor for damages. It was in the first place held that the defendant, while engaged upon the work of installation, necessarily made the packing company's plant its own working place to the extent necessary to install the apparatus. But to recover, the plaintiff must prove that his injury was caused by a danger which the defendant might reasonably have anticipated. The injury was caused in the following manner: It being necessary to lift certain piping to a second-story window, he determined to rig a block and tackle from the window to the third story, and for this purpose sent the plaintiff for rope with which to tie cross timbers. As the plaintiff started to untangle the rope, he straightened up, raising one hand above his head, and, without looking, thrust his fingers into an electric fan installed in the upper part of the window, the bottom edge of the fan being higher from the floor than the plaintiff's height, resulting in three of his fingers being amputated. It was held that the danger of such an injury was not one reasonably to have been anticipated, and that the defendant was not negligent in failing to provide against it. Vilter Mfg. Co. vs. Quirk, C. C. A., 199 Fed. 766.

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

CENTRAL PLANTS.

Central Station Heating. Jay Grant De Remer. This second part of a serial discusses the natural ratio between central station products and district demands. 4000 w. Engineering Magazine—March, 1914. 40c.

Hot Water Central Station Heating. Illustrated description of a tunel system for supplying hot water heat and domestic water supply to a number of scattered buildings from a central plant at Nela Park, East Cleveland, Ohio. 2000 w. Prac. Engr., Chicago—Feb. 1, 1914. 20c.

LARGE BULDINGS.

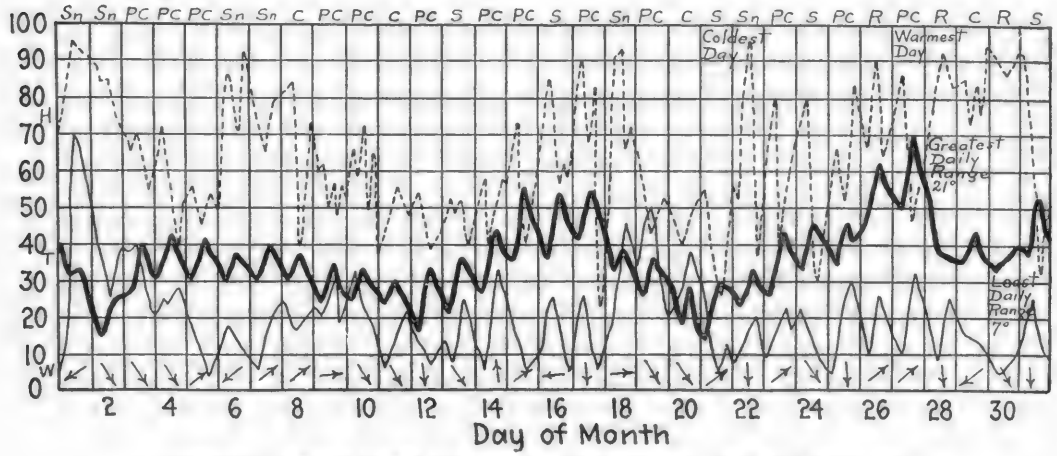
Heating and Ventilating Large Buildings. Charles L. Hubbard. The present number considers the hot water supply. Ills. 1500 w. Prac. Engr., Chicago—Feb. 15, 1914. 20c.

SCHOOLS.

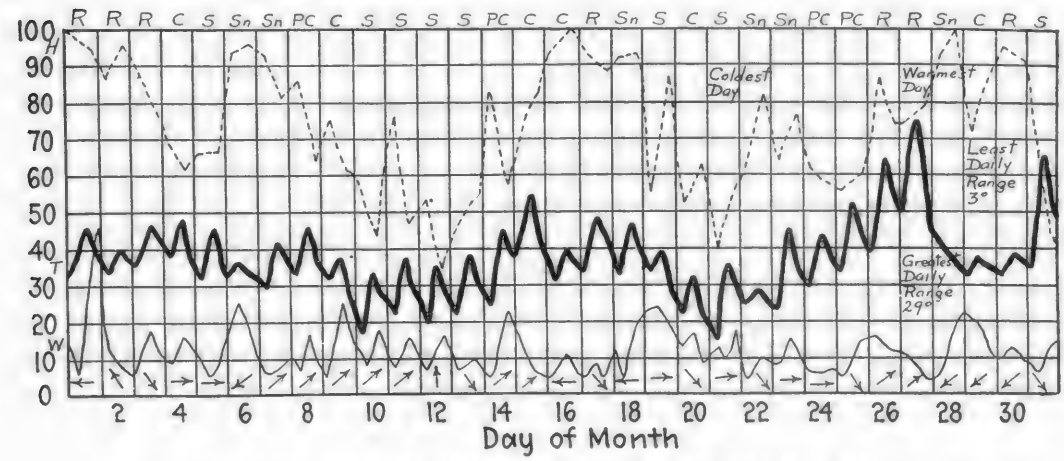
Fresh Air in Schoolrooms. John B. Todd. Describes the use of cloth window screens which let in plenty of filtered air, without drafts. 3000 w. Sci. Am. Sup.—Feb. 21, 1914. 20c.

The Weather for March, 1914.

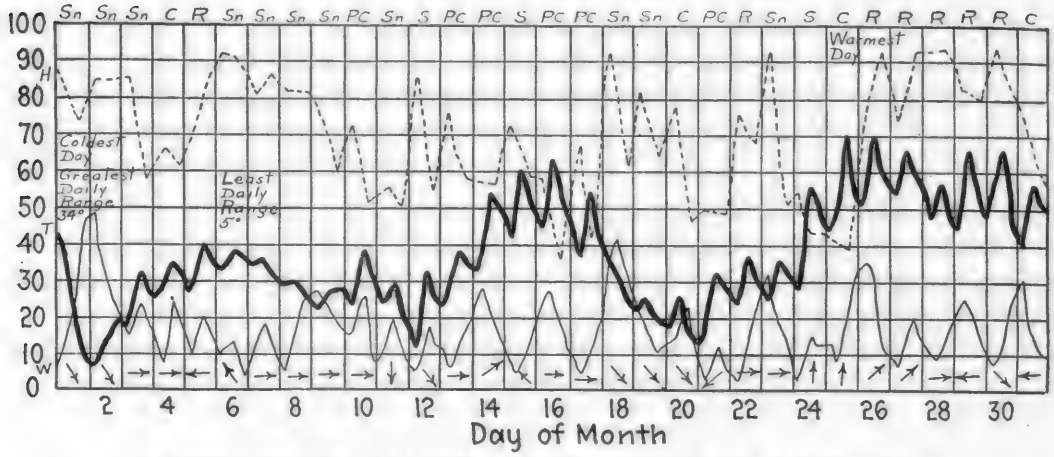
	New York.	Boston.	Pittsburgh.	Chicago.	St. Louis.
Highest temperature, degrees F	70	74	70	65	80
Date of highest temperature	27	27	25	15	15
Lowest temperature, degrees F	14	16	8	10	16
Date of lowest temperature	21	21	1	2	1
Greatest daily range, degrees F	21	29	34	28	33
Date of greatest daily range	28	27	1	26	14
Least daily range, degrees F	7	3	5	3	4
Date of least daily range	30	29	6	30	11
Mean temperature for month, degrees F	36	37	37	35.7	43.5
Normal Mean temp. for month, degrees F	37.5	35	39.5	34.4	43.5
Total rainfall, inches	4.55	4.16	2.12	1.87	1.25
Total snowfall, inches	21.5	5.2	8.3	1.2	5.2
Normal precipitation, this month, inches	4.1	4.08	3.	2.55	3.43
Total wind movement, miles	13,969	8,485	9,865	8,930	9,637
Average hourly wind velocity, miles	18.8	11.4	13.3	12	13
Prevailing direction of wind	N.W.	N.W.	W.	N.W.	N.W.
Number of clear days	5	8	4	6	12
Number of partly cloudy days	13	6	8	9	10
Number of cloudy days	13	17	19	16	9
Number of days on which rain fell	3	8	7	9	9
Number of days on which snow fell	6	6	11	9	3
Snow on ground at end of month, in	....	....	....	....	....



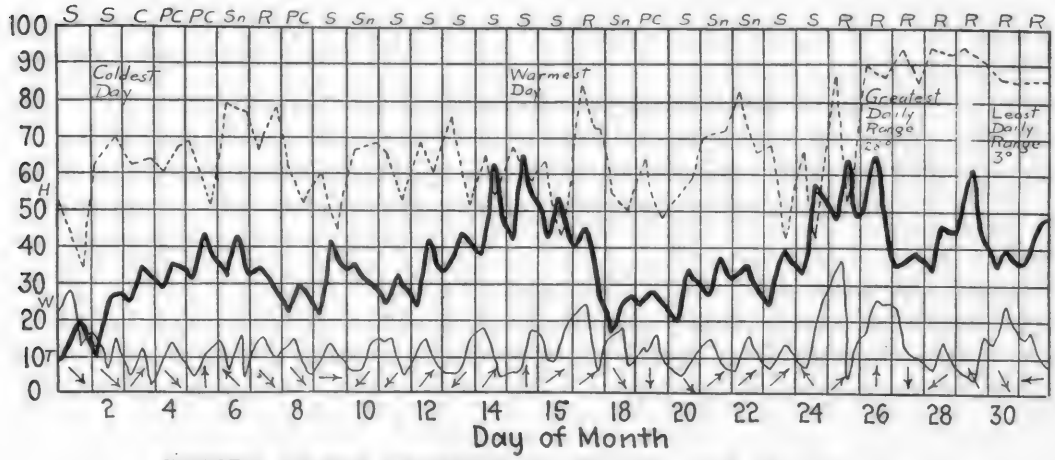
RECORD OF THE WEATHER IN NEW YORK FOR MARCH, 1914,
(Hourly Observations of the Relative Humidity Are Plotted on This Chart.)



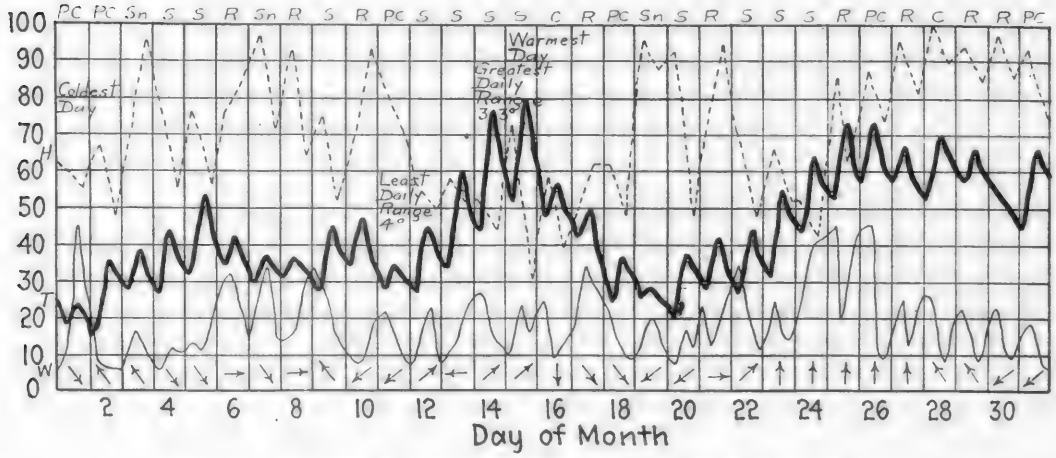
RECORD OF THE WEATHER IN BOSTON FOR MARCH, 1914.


Sn Sn Sn C R Sn Sn Sn Sn PC Sn S PC PC S PC PC Sn Sn C PC R Sn S C R R R R R C
Warmest Day
Coldest Day
Greatest Daily Range 34°
Least Daily Range 5°
H
T
W
100 90 80 70 60 50 40 30 20 10 0
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

RECORD OF THE WEATHER IN PITTSBURGH FOR MARCH, 1914.


S S C PC PC Sn R PC S Sn S S S S S S S R Sn PC S Sn Sn S S R R R R R R R
Coldest Day
Warmest Day
Greatest Daily Range 23°
Least Daily Range 3°
H
W
T
100 90 80 70 60 50 40 30 20 10 0
2 4 6 8 10 12 14 15 18 20 22 24 26 28 30
Day of Month

RECORD OF THE WEATHER IN CHICAGO FOR MARCH, 1914.


PC PC Sn S S R Sn R S R PC S S S S C R PC Sn S R S S S R PC R C R R PC
Warmest Day
Greatest Daily Range 31°
Coldest Day
Least Daily Range 4°
H
T
W
100 90 80 70 60 50 40 30 20 10 0
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

RECORD OF THE WEATHER IN ST. LOUIS FOR MARCH, 1914.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.

Heavy lines indicate temperature in degrees F.

Light lines indicate wind in miles per hour.

Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.

S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.

Arrows fly with prevailing direction of wind.

NATIONAL DISTRICT HEATING ASSOCIATION

Program for Sixth Annual Convention

The sixth annual convention of the National District Heating Association will be held in Rochester, N. Y., on Tuesday, Wednesday, Thursday and Friday, May 26, 27, 28 and 29, 1914, with headquarters at the Seneca Hotel.

The completed programme, as issued by Secretary D. L. Gaskill, is as follows:

TUESDAY, MAY 26, 2 P. M.

Welcome address by the Mayor of Rochester.

Response.

President's address.

Report of secretary-treasurer.

Appointment of nominating committee.

Report of underground construction committee, Mr. E. Darrow, Indianapolis, Ind., chairman.

Entertainment for the ladies, auto ride leaving Seneca Hotel at 3 P. M., and returning at 5.30 P. M.

TUESDAY, MAY 26, 8 P. M.

Report of the nominating committee.

Address: R. M. Searle, vice-president, Rochester Railway and Light Company. Subject: "Public Policy of Utilities."

Address: "Manufacture of Welded Iron and Steel Pipe," accompanied by moving pictures showing the progress of manufacture.

At the evening session the ladies will be invited to attend as the addresses will be interesting to all.

WEDNESDAY, MAY 27, 9.30 A. M.

Report of the Meter Committee, A. D. Spencer, Detroit, Mich., chairman; "Use of Bleeder Turbines in Connection with Steam Heating," by R. D. DeWolf, Rochester, N. Y.

Election of officers.

Report of Record Committee, A. P. Biggs, Detroit, Mich., chairman.

WEDNESDAY, MAY 27, 2 P. M.

Discussion session. Subjects to be discussed as follows:

"Hot Water Heating under Forced Circulation."

"Expense of Operating Centrifugal Pumps vs. Double Acting Pumps."

"Some Effects of Utility Regulation as Affecting District Heating."

"Effect of Superheated Steam on Heating Systems."

"District Heating for Small Towns and Cities of 10,000 Population and Under."

"Heat Losses from Buildings of Latest Construction."

"Which Is More Profitable, to Shut Off Steam at Night or Keep It on Continuously?"

"Economic Advantages to Consumers of Central Station Heating Service over Individual Heating Plants."

Entertainment for Wednesday: For the ladies, Wednesday morning, shopping tours; Wednesday afternoon, trip on Lake Ontario, returning at 6 P. M.

WEDNESDAY EVENING.

Theater party for all.

THURSDAY, MAY 28, 9.30 A. M.

Report of Rate Committee, E. L. Wilder, Rochester, N. Y., chairman.

"Customers' Steam Heating Systems," H. R. Wetherell, Peoria, Ill.

THURSDAY, MAY 28, 2 P. M.

"Commercial Steam Heating in New York City," Geo. W. Martin, General Manager, New York Service Co.

Report of Educational Committee, D. S. Boyden, Boston, Mass., chairman.

Report of Station Operating Committee, B. T. Gifford, Grand Rapids, Mich., chairman.

Entertainment for Thursday: For the ladies, Thursday morning, 10:30, card party at Seneca Hotel, Thursday afternoon, auto ride, with tea at Oak Hill Country Club.

THURSDAY EVENING.

Informal dance for all at Seneca Hotel, 8:30 to 11:00 P. M.

For the men only, Thursday, 4 P. M., visit to the Taylor Instrument Factory.

FRIDAY, MAY 29.

The entire convention as the guest of the American District Steam Company will go to Niagara Falls on special Pullman train, via New York Central Lines, stopping en route at Lockport where the first district heating plant was installed, taking luncheon at the works of the American District Steam Company at North Tonawanda, and spending the afternoon sight-seeing at Niagara Falls, followed by dinner at the Clifton Hotel on the Canadian side, and returning to Rochester in the evening.

The programme as outlined is considered the best that the association has ever put forth and assurances already received indicate that the sixth convention will be the largest attended of any that the association has held.

A very cordial invitation is extended to those district heating stations that are not now members to join the association either at the convention or in advance.

There will be a complete exhibit in connection with the convention and applications for space should be made directly with the secretary of the association.

The Seneca Hotel at Rochester will be the headquarters of the association and reservations for rooms should be made directly with the hotel management.

Date Set for Society's Summer Meeting.

Arrangements have been made to hold the mid-summer meeting of the American Society of Heating and Ventilating Engineers in Cleveland, O., July 9-11, 1914. Headquarters will be at the Hotel Statler. One of the features of the meeting will be an all-day trip on one of the large Lake Erie steamers, with a professional session held on board, followed by a dinner in the evening and other entertainment. In addition to the usual number of papers, the programme for the meeting will include interesting committee reports on car ventilation, radiator location, special fan application, elimination of noise, chimneys and draft, industrial building installations.

The Cleveland committee which is making the local arrangements for the meeting is composed of Frank G. Thegley, 706 Rose Building, chairman; J. H. Bacon, Jr., W. M. Kingsbury, R. S. Mayer and F. H. Valentine.

Annual Meeting of New York Chapter.

The election of new officers and the appointment of important committees were the principal items of business transacted at the annual meeting of the New York Chapter, held April 20 at the Engineering Societies' Building. Walter S. Timmis was elected president for the ensuing year. The other officers elected are: Vice-president, William H. Driscoll; secretary, Wallace F. Goodnow; treasurer, Arthur Ritter; governors: Perry West, Homer Addams and Frank G. McCann.

The secretary's report showed the present membership to be 74, a slight decrease from last year. Treasurer Arthur Ritter reported a cash balance of $268.15, the expenses for the year amounting to $151.

D. D. Kimball stated that the New York State Commission on Ventilation would welcome the co-operation of the New York Chapter, and upon motion made by Perry West, it was voted to appoint a committee of three to be known as the chapter's ventilation committee. The members of this committee, as named by President Kimball, are: Frank T. Chapman, Frank G. McCann and George W. Knight. Another committee was appointed, consisting of Perry West, J. I. Lyle and Frank K. Chew, to take up other work pertaining to the good of the order. The duties to be assigned to each committee were outlined by Perry West in his motion. Mr. West stated that the chapter is in need of a permanent working force, whose duties will include the collecting and compiling of data on ventilation, the collection of criticisms directed at present methods of ventilation and the devising of ways and means of answering such criticisms. He also urged that the chapter should investigate, through its committees the subjects of recirculation, ozonation and humidification.

"The day is coming," declared Mr. West, "when the engineer will occupy the position held to-day by the architect. The office building is primarily an engineering problem, and instead of the architect's farming out 75% of such work, the engineer should take the building and farm out the architecture."

Chairman F. K. Davis of the chapter's annual dinner committee, reported that this event will be held at Reisenweber's, Eighth Avenue and 57th Street, May 18, and that it would be a "beefsteak" dinner.

J. I. Lyle brought up a recommendation contained in the report of Charles G. Armstrong on New York City's public school buildings and moved that the chapter endorse a recommendation contained in the report to the effect that the engineering department of the Department of Education be separated from the architectural department. The chapter voted to endorse this recommendation.

The subject for the evening's discussion, which was "Hot Water Heating," was then introduced by Ira N. Evans, who explained his scheme of "Vacua" hot water heating, in which use is made of both high and low pressure steam heaters, the temperature of the water being regulated by the vacuum carried in the condenser. Those taking part in the discussion included President D. D. Kimball, Homer Addams, F. K. Davis and Hugh J. Barron.

Illinois Chapter Discusses Methods of Testing Air Washers.

Air washers and fans, with especial reference to methods for testing their efficiency, were taken up at the April meeting of the Illinois Chapter, held April 13, in the Fraternity Room of the Great Northern Hotel, Chicago. The committee in charge of the meeting was composed of Messrs. Stacey, Hill and Chenoweth. Mr. Stacey presented a paper on "Outline of Data for Testing Air Washers." This was followed by a discussion by Dr. E. Vernon Hill, illustrated by lantern slides, showing methods used in the ventilation bureau of the Chicago Health Department for testing the efficiency of air washers. The slides included views of the Aitkin portable dust counter and sugar filters, the Aitkin device providing for the precipitation of the dust particles by the moisture in the apparatus, while in the sugar filter, the sugar, after being used, is dissolved in distilled water and the dust particles determined. Dr. Hill also showed a diffractoscope, an apparatus he had devised for determining the clearness of the air.

Frank L. Busey, of the Buffalo Forge Company, presented his illustrated address on "Fan Selection," in which he detailed the development of the modern fan.

The chapter's May meeting will be devoted to "Chimneys and Drafts." The chairman of the committee in charge of this subject is Charles F. Newport, and it is expected that members of the Chicago Smoke Commission will take part in the discussion.

Massachusetts Chapter on Inspection Trip.

After the transaction of the regular order of business at the April meeting of the Massachusetts Chapter, which was preceded by a dinner, the chapter proceeded in a body to inspect the heating and ventilating plant of the new Scollay Square Olympia Theatre, which is the largest popular-priced vaudeville and moving picture theatre in New England, seating 3,200 people.

This system consists of a fresh air supply for the theatre proper and all public rooms. Separate exhaust systems are provided for the lower floor of the theatre, gallery, balcony, public rooms and dressing rooms. Outdoor air first passes through the primary Vento heaters in the heater room, which is located under the main auditorium floor, thence through Carrier air washers and through secondary heaters to a Sirocco blower of 40,000 cu. ft. per minute capacity. Part of the air is discharged into the plenum space located between the auditorium floor and the basement ceiling and also to the public rooms. The remainder of the air is discharged into the plenum space under the balcony. The air then passes into the theatre and is distributed through "mushrooms" located under the seats of the auditorium and balcony floors, so that practically every person in the audience has an individual fresh air supply. The air washer and fan system is equipped with humidity and temperature control.

The air is exhausted from the theatre by means of three 48-in. propeller fans, one located under the balcony, another under the gallery and the third in a pent house on the roof. Large grilles located in the soffits of the balcony, gallery and main ceiling, are connected to the fans by galvanized iron ducts.

Every effort was made to have the air of the public rooms and dressing rooms as fresh as that of any other part of the theatre. The air in all the public rooms is changed at least twelve times per hour by the propeller fan. It should also be stated that large vent grilles are placed in the ceiling of the dressing rooms and are connected to a powerful propeller fan under the stage which discharges the air outdoors.

The heating system is of the vacuum type. Two horizontal tubular 66-in. boilers, with 16-ft. tubes, equipped with smoke consumers and Sidney Smith settings, supply the steam required for the theatre and, in addition, for the large office building connected therewith, also for another adjoining theatre. All direct radiators are concealed behind grilles and are under Johnson thermostatic control.

The entire system was designed and its installation supervised by the Richard D. Kimball Co., Boston.

Organization of Master Fitters and Plumbers in Knoxville, Tenn.

The incorporation is announced of the Master Plumbers, Steam and Hot Water Fitters' Association of Knoxville, Tenn. Incorporators: W. H. Price, James F. Long, James A. Hannafin, Joseph A. Ahler, R. C. McGinnis, F. A. Engert, B. F. Long, W. A. Heins, J. W. Weathered, J. R. Warwick and G. B. Dearing.

Ohio Public Utility Companies Must File Inventories.

The Public Utilities Commission of Ohio has sent out an order to all utility companies in Ohio requiring them to file inventories of their utilities with the commission on or before August 1, 1914. This inventory must contain every item of value claimed by each company as a part of its valuation which might be considered by the commission in making orders affecting rates or other service.

Arrangements of Blower Systems to Reduce the Fire Hazard.

Suggestions for reducing the fire hazard where blower systems are in use are contained in a report submitted to the National Fire Protection Association at its annual meeting May 5-7. The report, which was made by a committee of which A. M. Feldman, of New York, is chairman, is in the form of a tentative set of specifications and covers blower systems for heating and ventilating and also stock and refuse conveying.

Under "Heating and Ventilating Systems" the general standards as proposed include, among other things, the following:

Ducts: Openings through floors for the circulation of air from one story to another shall not be used.

The passing of ducts through fire walls should be avoided wherever possible. Where ducts pass through fire walls they should be provided with automatic dampers located in each side of the wall through which they pass (see Fig. 1).

All ducts passing through floors shall be made of or protected throughout by approved fire-resisting material, not less than 4 in. thick.

Where ducts serve more than one floor, automatic dampers shall be provided on all outlets opening directly from such ducts and at all connections with branch ducts. (See Figs. 2 and 3.)

Entire system of ducts to be self-contained; no hallways, rooms, attics, hollow spaces, voids, or other portions of the building to be used for air chambers or ducts, unless of fire-resisting construction, and then only by permission of the Inspection Department having jurisdiction.

Ducts to be made of galvanized iron or other approved non-combustible material. The same applies to enclosures of steam coils used for heating air.

To be thoroughly braced.

To be substantially supported by metal hangers or brackets.

Where subject to mechanical injury, ducts to be properly protected.

In no case shall the clearance between any metal ducts and combustible material be less than 1 in.

Joints between ducts and floors, walls or partitions to be made tight by non-combustible material.

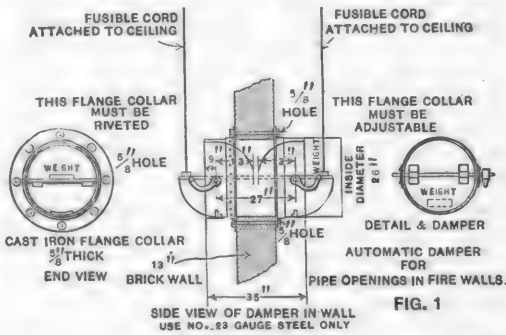
Outlets on supply and exhaust ducts should always be protected by means of register faces or wire screens.

Intake of air to be from outside except in recirculating systems, and should be taken only from areas containing non-combustible material. Intakes to be protected with rolling shutters or heavy doors.

Intake and intake rooms, steam coils, blowers, etc., also ducts connecting blowers with vertical ducts which pierce floors, shall be segregated in a room cut off by fire-resisting partitions from other portions of the building. Where any such ducts must of necessity pass through other portions of the building, they shall be protected by 4 in. of approved fire-resisting materials as required for ducts passing through floors.

Ventilation of Cooking Apparatus.—Ventilating ducts used to carry off the grease-laden vapors from hoods over cooking appliances, especially in kitchens in large restaurants and hotels, should be constructed similarly to boiler smoke flues. A live steam jet should be provided at the end of the duct nearest the cooking appliances.

Under "Stock and Refuse Conveying Systems," which are described in the report as especially hazardous on account of the high



Courtesy Insurance Field.

FIG. 1.—AUTOMATIC DAMPER FOR PIPE OPENINGS IN FIRE WALLS.

velocity of the air and the inflammability of the stock or refuse which these systems are usually designed to handle, the following additional requirements are suggested:

BLOWERS.

Bearings of blowers shall not extend inside of blower casings or ducts.

It is recommended that oilless self-lubricating bearings be used, made of bronze bushings with plugs such as graphite or metaline.

Connections between discharge end of blower and main duct to be made so as to prevent leakage of fine dust.

Blowers through which inflammable materials pass shall have blades of composition, copper or brass. Ample clearance to be provided for all blades.

Blower systems should preferably have an emergency or automatic control to shut them down in case of fire. This may be done automatically by means of devices utilizing fusible links or thermostats. Such installations to be subject to the approval of the Inspection Department having jurisdiction.

DUCTS.

Ducts for conveying stock and refuse should be made of suitable non-combustible materials,

preferably galvanized iron with all joints riveted and soldered.

Lock joints are acceptable for longitudinal seams in pipes used under suction and in small pipes.

Spiral pipes to be full riveted and soldered.

All joints shall be made dust-proof.

The minimum thickness of metal used shall

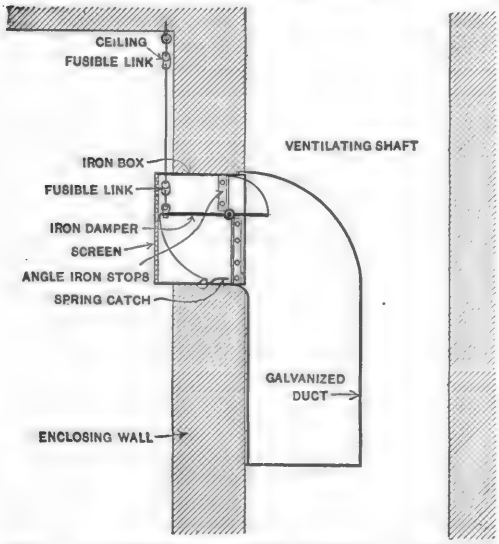


FIG. 2.—TYPICAL AUTOMATIC DAMPER.

be as follows: up to 12-in. diameter to be No. 24 U. S. gauge; 12-in. diameter and over, No. 22; 24-in. diameter and over, No. 20 gauge; 40-in. diameter and over, No. 18 gauge.

Provision should be made for the wear due to friction, at all points of change of direction, by making long bends, by using heavier metal and in case where abrasive materials are to be conveyed, by inserting an approved form of inside lining that may readily be renewed.

Suitable tight-fitting sliding clean-out doors to be provided on all conveyor ducts at sufficient intervals to facilitate cleaning of ducts or removing obstructions.

Suction ducts should be provided at all machines producing dust or combustible refuse and connected to exhaust fans.

"Sweep-up" pipes should be so protected as not to admit material which would be large enough to damage blower.

When possible a trunk line should be run on the outside wall of the building with ducts from each machine and each floor, passing out directly through the wall and discharge into the trunk line. If inside of building, the trunk duct should be overhead rather than under the benches.

The air vents from the system shall discharge outside of building.

Where dust or readily inflammable material can accumulate on or near blowers and ducts, they should be grounded to prevent ignition of these materials from a discharge of static electricity such as may be generated by belt.

AUTOMATIC SPRINKLERS.

There shall be a sprinkler near the feed end, and at the discharge outlet, inside the condenser, if such is used, and also a sprinkler to protect the blower. In some cases, sprinklers may be installed inside the ducts. Such sprinklers should be arranged in an off-set or dome-shaped casing and not in the direct path of the draft. Sprinklers with smooth deflectors that will not catch the flying stock are desirable.

CYCLONE COLLECTORS OR SEPARATORS.

The cyclones or separators shall be outside the building, and so located as not to constitute a hazard to adjacent structures. Their construction and supports shall be of incombustible material. If the cyclone of necessity is placed within 10 ft. of wooden walls, inflammable structures, or openings into buildings, it should be provided with a metal pipe extending to a point above the main roof, or other safe location.

The refuse from the cyclones and separators is to discharge by gravity into a vault as described in section on vaults.

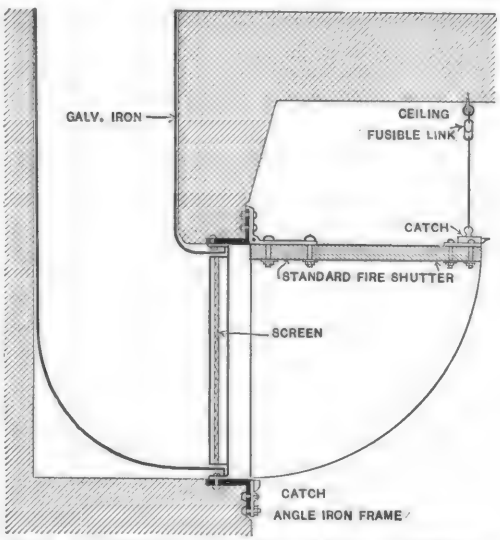


FIG. 3.—TYPICAL AUTOMATIC SHUTTER.

If the discharge from the cyclone or separator conveys the refuse directly to fire boxes of boilers, the pipe should be provided with automatic fire damper, close to the fire boxes, so arranged that the damper closes automatically, as soon as the fan is stopped or in case of a "back fire."

The air vent from the separator must never be connected to a chimney.

If the air vent carries objectionable dust, as in the case of refuse, such as from grain elevators, etc., the use of a simple air washer, or other suitable filter, is recommended for eliminating the dust.

SPECIAL CASES.

Readily ignitible stock, such as cotton, should not pass through the fan. The system should never be connected directly to picker or other hazardous machines. Systems handling such stock should operate entirely under suction with a device such as a "condenser," or large separating chamber to discharge the stock from the pipe or conduit before it reaches the fan. Stock should be fed to system preferably by hand. Stock should enter such a system in an upward direction and the pipe should continue upward for at least 10 ft. to allow any heavy substances or foreign material in the stock to drop out. If the pipe must leave the room at a lower level a long radius inverted U may be used to obtain the necessary vertical distance.

Systems using mixtures of cotton and wool which cannot be handled by condensers and which operate under fan pressure, should discharge to non-combustible bins or boxes with outside vents through screens.

Conditions which approach those favorable for explosive mixtures should be subject to a special investigation.

The dust from sand-papering machines, granulators and pulverizers, baffing or polishing wheels, emery wheels and from other machines producing a very fine dust, should have a suction system independent of the cyclone, which connects with the refuse vault.

The dust should be settled by spraying in an enclosed chamber of incombustible material, thus eliminating the hazard of the dust room.

Dust from the machines may also be discharged directly into running water if suitable provision is made for its collection and removal.

For mills, such as malt, cereals, sugar, celluloid, etc., it is recommended that an explosion flap be provided in a metal pipe leading outside of the building so that in case of an explosion in the mill the flap opens and the explosion spends itself outside the building.

VAULTS.

Vaults for shavings, refuse, etc., shall be located outside and not exposing adjacent property. Walls, floor and roof shall be of brick or other approved fire-resisting material; walls not less than 12 in. thick.

Openings, if any, between vault and boiler room should not exceed 9 sq. ft., and bottom of opening be not less than 4 in. above the level of boiler room floor. Openings to be located at least 8 ft. from the firing door of boiler, preferably at right angles and protected by a standard automatic fire door.

Vault to be protected by automatic sprinklers or steam jet. If steam jet is used, to consist of a 1½-in. pipe connecting direct from boilers or main steam line and provided with a quick opening lever valve, the steam jet to be arranged with two 1-in. branch pipes extending into the vault, the lower branch pipe to be placed not less than 3 ft. from the floor and the upper branch pipe to be placed near the ceiling.

Where dust-producing machines are used only on a small scale, the dust or refuse may, by special permission of the Inspection Department having jurisdiction, discharge into a substantial metal dust box, or other approved receptacle located outside the building, in lieu of a vault. The receptacle to have a hinged door or cover, which will readily open and vent a fire or explosion within.

A water tank may be used in lieu of the dust box. In such cases the tank should be provided with water supply, overflow and drain pipes. On the water supply pipe a proper float controlled valve shall be installed to maintain a constant water level. It is recommended that the end of duct be submerged into the water at least 1 in.

The committee which drew up the report is composed of A. M. Feldman, chairman; R. P. Bolton, H. A. Burnham, W. W. Crosby, E. W. Dart, J. H. Derby, J. A. Donnelly, F. W. Eames, J. C. Knight, W. L. Plack, Benj. Richards, A. M. Schoen, Theo. S. Tenney.

Mr. Feldman also represented the American Institute of Consulting Engineers at the National Fire Protection Association's Convention.

Proposed National Separate Contract Law.

Following is the text of the bill recently introduced in the House of Representatives at Washington, by Congressman Taggart, designed to separate heating and ventilating, plumbing, gas fitting and electrical work from the general contract on all Federal buildings throughout the country. The bill has been endorsed by the national master plumbers' and master fitters' associations, and is now in the hands of the Committee on Public Buildings and Grounds. It is listed as H. R. 14288, 63d Congress, second session:

A bill relating to contracts for the erection or alteration of public buildings.

Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That every department or board, bureau, commission, body, or person charged with the duty of preparing plans, specifications, and blueprints for the erection, alteration, or repair of any building in any State or Territory or in the District of Columbia, by the United States, and every officer or person designated by such department, or board, or bureau, or commission, or body to act for it and in its stead, and charged with

the duty of preparing such plans, specifications, and blueprints, which shall provide for the installation of plumbing and gas-fitting and all work kindred thereto, or of the steam and hot-water heating, ventilating apparatus, steam-power plant and all work kindred thereto, or the electrical equipment and all work kindred thereto, shall, when the entire cost of the erection, alteration, or repair of the plumbing and gas-fitting and all work kindred thereto, or the steam and hot-water heating, ventilating apparatus, steam-power plant and all work kindred thereto, or the electrical equipment and all work kindred thereto, is to exceed the sum of $1,000, hereafter prepare separate plans, specifications, and blueprints for each of the following branches or classes of the work to be performed:

First: Plumbing and gas-fitting, and all work kindred thereto.

Second: Steam and hot-water heating, ventilating apparatus, steam-power plant, and all work kindred thereto.

Third: Electrical equipment, and all work kindred thereto.

Such plans, specifications, and blueprints must be so prepared and drawn as to permit separate and independent proposals and bids upon each of the branches or classes of work in the three above sub-divisions.

Sec. 2. That every department, or board, or bureau, or commission, or body, or person charged with the duty of awarding or entering into contracts for the erection, alteration, or repair of any building in any State or Territory or in the District of Columbia, by the United States, and every officer or person designated by such department or board, or bureau, or commission, or body to act for it and in its stead, and charged with the duty and duly empowered to award and enter into such contracts, which shall provide for the installation of plumbing and gas-fitting, and all work kindred thereto, or the steam and hot-water heating, ventilating apparatus, steam-power plant, and all work kindred thereto, or the electrical equipment and all work kindred thereto, shall, when the entire cost of the erection, alteration, or repair of the plumbing and gas-fitting and all work kindred thereto, or the steam and hot-water heating, ventilating apparatus, steam-power plant, and all work kindred thereto, or the electrical equipment and all work kindred thereto, is to exceed the sum of $1,000, hereafter award the respective work specified in the sub-divisions mentioned in section one hereof separately to responsible and reliable individuals, firms, or corporations.

Sec. 3. That all Acts and parts of Acts in conflict with the provisions of this Act are hereby repealed.

Sec. 4. That this Act shall take effect and be in force on and after the first day of October, nineteen hundred and fourteen.

The passage of the bill is said to be opposed by the supervising Architect's office on the ground that it should only apply to the larger installations.

The "Step" House, a New Type.

Something decidedly new in the way of building construction, designed primarily to admit more air and light to apartment houses, has recently been built in Paris. It is a form of dwelling which has been named the "step" house. The designers of this unique type of building are MM. Sauvage and Sarrazin and the first example of their work has recently been completed in the Rue Vavin, near the Boulevard Raspail. The architects have termed this new style of dwelling "une maison à gradins," or "step" house.

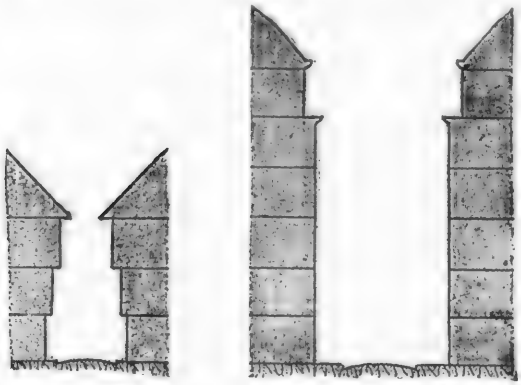
It is well known, of course, that to obtain the maximum revenue from the capital invested in the construction of an apartment house, it is necessary to build over the entire surface of the land purchased and to the greatest height possible. In order, however, to secure sufficient light and ventilation for rear rooms, it is necessary to have an area of suitable dimensions. In the plan as carried out by the two French architects, the stories, beginning with the second, are made to rise in steps, each set farther back than the preceding one and presenting the general appearance of a monumental stairway, "broadening the street" with each succeeding story. These ledges are used to make terraces, each about 7 ft. wide.

Excepting the suite on the ground floor, each apartment thus has a terrace about 55 ft. long. In addition to offering opportunities for the placing of flower boxes and jardinieres, this arrangement also gives to the lower floors an additional hour of sunlight. The flower boxes which border the terraces prevent the tenant from looking directly down on those below him, but a view of the street is easily obtainable from each story.

The architects state that objections have been made to the scheme first on the ground that the top floors are reduced to a depth almost too small to be practicable, and second, that too much floor space is lost in carrying out the plan. By referring to the illustrations it will be noted that these obstacles have been foreseen by the architects. To the anterior recesses, posterior projections have been arranged to correspond, so that the front rooms have an even 25 ft. depth on all eight floors At the ninth, they have nearly 20 ft. As

the surface utilized, what is lost in room width is gained in height.

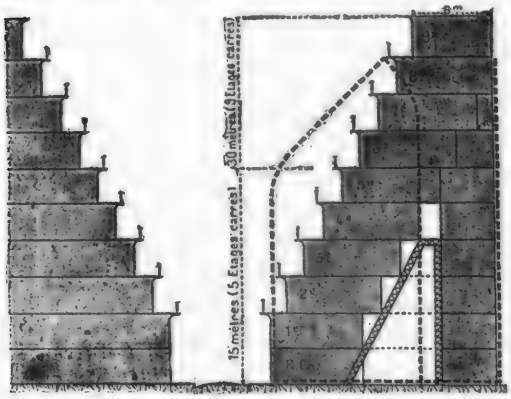
From the standpoint of cost, the architects figure that the "step" house may be built at a cost that will make possible a reduction of from 25% to 30% in the rent as compared with similar apartments. In this connection the architects have adopted



In the Frowning Middle Ages

Usual Construction in Paris Today—Street 26 Feet Wide

a novel renting scheme whereby the tenants in a given apartment house organize themselves as a co-operative society. The tenant thus becomes a shareholder and in consequence a co-proprietor. He has a



PROPOSED CONSTRUCTION OF "STEF" HOUSE, TO ADMIT MORE AIR AND LIGHT.

right to a proportionate reduction in the rent. For example, a man who subscribes $1,000 will be entitled to a reduction of $50.

A Small Electric Fan That Ventilates is a timely circular published by the American Blower Co., Detroit, Mich., calling attention to the "Venture" reversible electric fan for ventilating small offices, kitchens, toilets, etc. The fan is adapted for use with house current.

Death of James E. Heg.

The heating trade lost one of its notable figures in the death of James E. Heg, for many years president of the Automatic Heating Company, of New York, and later at the head of James E. Heg & Co., Chicago, operating the Paul Steam System Company at that point. Mr. Heg had been ill since last Fall. He died April 6 at his home in Chicago, at the age of 62 years.

For many years Mr. Heg was in the newspaper business in Wisconsin, having at one time been president of the Wisconsin Press Association. He was later appointed a member of the State Board of Control of Wisconsin, afterward becoming president of the board. He retired from this office to assume the position of superintendent of the Wisconsin State Reformatory.

During the early years of the vacuum heating business, Mr. Heg took a prominent part in handling the Paul patents, his company, the Automatic Heating Co., being the owner of the Paul air valve patents.

He was one of the original stockholders in the Heating and Ventilating Magazine Company and took a warm interest in the development of the magazine.

He is survived by his widow, two sons and two daughters. The burial took place April 8 at Geneva, Wis.

Patent on Combined Pressure and Temperature Control Valve.

A patent on a combined pressure and temperature control valve was granted March 31, 1914, to J. C. Hornung, 111 West Monroe St., Chicago, engineer and dealer in heating specialties. This type of valve is adapted for use in connection with central station heating plants and the like, the invention having for its object the combination in a valve of means to maintain a constant given head of pressure in the house heating system irrespective of the variations of pressure in the main, subject, however, to modifications of such house pressure in order to maintain a constant temperature in the house. Both pressure control valve and temperature control valves are old to the art, but the combination whereby the pressure control valve is itself under the direct influence of a temperature control valve is believed to be new and has proven to be of great importance. This combination valve, it is stated, has been in practical operation for the past four seasons and has fully demonstrated its ability to maintain pressures and temperatures at the desired points. The construction of this device is shown in the advertising section of this issue.

Discussion of Tests on Pressed Steel Radiators.

Following are some of the points made in the discussion of Prof. John R. Allen's paper on "Coefficient of Heat Transmission in a Pressed Steel Radiator," read at the recent annual meeting of the heating engineer's society:

MR. W. F. VERNER: The idea was to have these tests conducted under as near actual operating conditions as would occur in the ordinary room. In a good many of the previous tests on radiators for the transmission coefficient the apparatus was set up in a laboratory and the necessary data secured. Naturally the conditions under which the radiator is working in the laboratory is not the same as when it is placed in a room for keeping the temperature of the room at a desired point. The offices were equipped with the ordinary ventilating apparatus as used in school buildings. When the tests were conducted the air supply was shut off and the radiator only took care of the heat losses from the room.

MR. F. H. DAVIS: Going over Table 1, Prof. Allen's results agree closely with those I obtained about three years ago and reported to the society two years ago to the effect that radiation placed at right angles to the wall or away from the wall is more efficient than when placed under the window. There was a good deal of discussion about it at the time. I am rather glad to see that Prof. Allen's results are near mine.

MR. VERNER: In making these tests the idea was to secure more information on the transmission coefficient and also as to the time limit and effect of having the radiator parallel to the wall and at right angles to it. Complete tests were made on the pressed steel radiator and on the cast-iron radiator, but the results are not intended to show the superiority of one form of radiator over the other.

MR. C. F. NEWPORT: I would like to inquire as to the method of removal of air from these radiators? It seems that the B. T. U. transmission is pretty low for a 2-col. cast-iron radiator.

MR. VERNER: The radiators when first installed had air valves located at the top and there was some difficulty in getting rid of the air in a short time. To correct this the air valves were placed near the bottom, which made a better arrangement. A slight amount of steam was allowed to escape from the air valves continuously, so as to be sure that no air was left in the radiator.

MR. F. L. BUSEY: I have had occasion to make a good many tests on radiators to check radiation and I found a great deal of trouble in getting the air out of the radiators. I tried different valves and also tried blowing them out for quite a while. Finally I decided, to get uniform results, I would have to place an air valve on every loop and blow them out thoroughly. The results at times would be ragged. The only reason I could find for it was air in some of the sections that were not properly blown out.

MR. J. A. DONNELLY: Prof. Allen has apparently assumed that each of the radiators was completely filled with steam. I do not think that assumption is warranted. I think some means should be adopted to prove that there is no air in the radiators.

When I was on the committee on tests two years ago, we found and reported to the society that one of the best methods of testing to see whether the air was all out of the radiator was to observe the temperature of the return water. A collection in the radiator of 1% or 2% of air would drop the temperature of the water 5° or 6°, so that it was very quickly apparent that at a uniform temperature it was necessary to keep a jet of steam playing immediately over the surface of the water all the time that it was shut off; inside of two or three minutes the temperature of the water would begin to drop, showing apparently to us that air was collecting. If I remember rightly we filled the radiator with water.

NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS

Michigan State Association.

Endorsement of the bill now pending in Congress for the separation of contracts for heating and ventilating, plumbing and gas fitting, and the adoption of a resolution urging its own members to refrain from accepting sub-contracts, were the principal actions taken at the second annual convention of the Michigan Association of Master Steam and Hot Water Fitters, at Grand Rapids, March 26. An attendance of 40 members was registered. President G. W. McCullom, of Muskegon, called the convention to order. In addition to the reports of officers and committees, addresses were made by Julius Ziesse, of Grand Rapids, and President Edward B. Denny, of the national association. The following officers were elected: President, Julius Ziesse, Grand Rapids; vice-president, William Gourley, Detroit; secretary, Otto Wurm Detroit; directors: C. A. Blaney, Kalamazoo, and William Pulte, Grand Rapids. Next year's convention will be held in Detroit.

New York City Association.

Following are the officers elected at the recent annual meeting of the New York City Association of Master Steam and Hot Water

Fitters; President, John E. Jeffrey; vice-president, Joseph G. Geoghegan; treasurer, William H. Curtin; directors; John E. Jeffrey, Joseph G. Geoghegan, William H. Curtin, M. J. Callahan and J. E. Rutzler; secretary, Henry B. Gombers.

Newark (N. J.) Association.

At the annual meeting of the Newark Association of Master Steam and Hot Water Fitters, which was held March 17, the following officers were elected: President, Walter A. Lawson; vice-president, John G. Keller; secretary, Harry Geiser; treasurer, W. M. Whitlock; member of the executive board, Edward B. Denny and Robert Berla.

Washington (D. C.) Association.

Officers elected at the annual meeting of the Association of Master Steam and Water Fitters of the District of Columbia are as follows: President, Warren W. Biggs; vice-president, S. Franklin Gardner; secretary-treasurer, D. D. Condon.

Los Angeles (Cal.) Association.

The newly-elected officers of the Los Angeles Association of Master Steam and Hot Water Fitters are: President, E. E. Emerson; vice-president, V. W. Guercio; treasurer, S. J. Brown; directors: W. B. McKinley and E. P. Nittinger. The secretary of the association is George B. Larimer, 410 Union League Building, Los Angeles.

Ontario Society of Domestic, Sanitary and Heating Engineers Adopts Standard Hot Water Heating Specification.

A standard specification for hot water heating, as proposed by the board of directors of the Ontario Society of Domestic, Sanitary and Heating Engineers, at the third annual convention of that body, in Toronto, March 19-21, was adopted by the meeting and its use recommended throughout Ontario. The directors stated that it was impossible to compile a standard steam heating specification, as there are so many systems of steam heating. Following is the hot water heating specification as adopted:

Specification of Hot Water Heating System Proposed For.

Boiler.—Provide and fit up in basement where shown on plan a number —— hot water boiler with all attachments complete.

Foundation.—A suitable foundation to set boiler upon is to be provided by owner.

Smoke Pipe.—Connect the boiler to chimney in basement with a heavy galvanized iron smoke pipe, the same size as collar in boiler with damper in same. A flue of sufficient size to be provided by owner.

Blow-off.—A ¾-in. heavy brass steam cock with hose end to be placed at low point in system for the purpose of emptying same.

Radiators.—Provide and set up cast-iron radiators, all to be of the pattern sizes and heights given in the accompanying schedule.

Radiator Valves and Air Vents.—Provide and fit to each radiator a wood wheel nickel-plated heavy brass valve; also a wood-wheel nickel-plated brass air vent.

Piping.—The radiators shall be connected to boiler with flow and return pipes of such sizes and so adjusted that each radiator will have a free and easy circulation of water with a low fire. Radiators containing 48 sq. ft. and less to have 1-in. piping over 48 sq. ft. and under 100 sq. ft. to have 1¼-in. piping, and those with over 100 sq. ft. to have 1½-in. piping, all accompanying flow and return piping to be of the same size.

Separate flow and return piping to be run from boiler for ground floor radiators.

All piping to be of best manufacture of standard sizes, and to be put together in a strong, neat and substantial manner.

Fittings.—All fittings to be cast-iron of a heavy beaded pattern and free from all defects.

Hangers.—All piping in basement to be securely suspended from ceiling timbers with strong adjustable hangers.

Floor and Ceiling Plates.—Where pipes pass through floors, ceilings or partitions above basement, the opening shall be fitted with nickel-plated floor and ceiling plates.

Covering.—All flow and return piping in basement to be covered with ½-in. hair felt and strong cotton securely sewn on, or sectional air cell asbestos lined covering.

Expansion Tank and Supply.—Provide and fit up above all circulation a heavy built galvanized iron expansion tank of ample capacity to allow for expansion of water, and fitted with long water glass and brass mountings. Tank to be connected to heating system with 1-in expansion pipe. The water supply to system to be taken from nearest water supply and to be connected with a ½-in. service pipe having compression stop cock. From top of tank run up a 1-in. vapor pipe into roof space and just above tank branch in a 1-in. overflow pipe and carry same down to within two feet of cellar floor.

Generally.—The whole of the above work to be done in a neat and workmanlike manner. All material to be first quality and all to be thoroughly tested and left in complete working order.

Payment.—Payment to be made as the work progresses at the rate —— per cent. of the value of the work done and material deposited, the balance to be paid within —— days after the completion of work.

————, Heating Engineer.

19 .

It is understood and agreed between the parties to this agreement that the said (insert name of heating engineer) is to be entitled to a lien on the goods, chattels and fixtures herein referred to until payment thereof, and that in default of payment the said (insert name of heating engineer) is to be entitled to immediate repossession thereof; the property in the said goods, chattels and effects to remain vested in the said (insert name of heating engineer) until complete payment therefor by the purchaser.

Signature.....

Signature.....

Technical League of America.

A consolidation of the Technical League of Engineers and the American Society of Engineer Draftsmen has recently been effected, the new body taking the name of the Technical League of America. This name, it is stated, was adopted because it includes architecture and every branch of engineering, as well as every grade of worker in all these branches. The league is now endeavoring to interest the great national engineering societies in having its members join the Technical League of America, possibly in a body. This move is a direct result of the discussion which took place at the recent annual meeting of the American Institute of Electrical Engineers on the proposal to combine the membership, or parts thereof, of the larger engineering societies in one association, with the idea of "fostering and developing the human factor in the engineering profession, to place the engineer on the same plane as the lawyer and doctor" and "for the discussion of engineering in general * * * except scientific and technical subjects." The discussion of the idea brought out the points that an organization is needed separate from those of a scientific character to develop the standing of the engineer as a social unit and also that there is no "adjectival" distinction between engineers when their interests in society are to be protected or advanced, and that at such a time, architectural, civil, electrical, mechanical and mining engineers stand as a unit. The league's headquarters are at 74 Cortlandt St., New York. Walter M. Smith is general secretary.

Floating Exposition of American Products.

A floating exposition designed to introduce the products of American manufacturers to the merchants of the West Indies and South America, with the object of increasing trade with those countries, is being arranged by the American Trade Tour Company, 15 Maiden Lane, New York. The steamship Kroonland, one of the large North Atlantic liners, has been chartered and there will be accommodations for 400 traveling salesmen. The tour is planned to extend over 120 days. Space will be provided for the display of the manufactured products of several hundred concerns In each port the merchants of the town will be invited aboard the ship to see the exhibits and talk with the salesmen.

According to the present plans, the American Tour Company's expedition will leave New York October 14 next for the West Indies. Havana, Santiago and Kingston will be visited, after which the Kroonland will head for South America. At Buenos Ayres the Kroonland will lay at anchor for two or three weeks to give the salesmen an opportunity of crossing over to Chili and visiting other places on the west coast. The company states that the State Department has promised to aid the project by instructing the American consuls in the various ports to co-operate with the exhibitors in making known the interesting features of the exhibit. The exhibitors will be confined entirely to American manufacturers.

NEW DEVICES

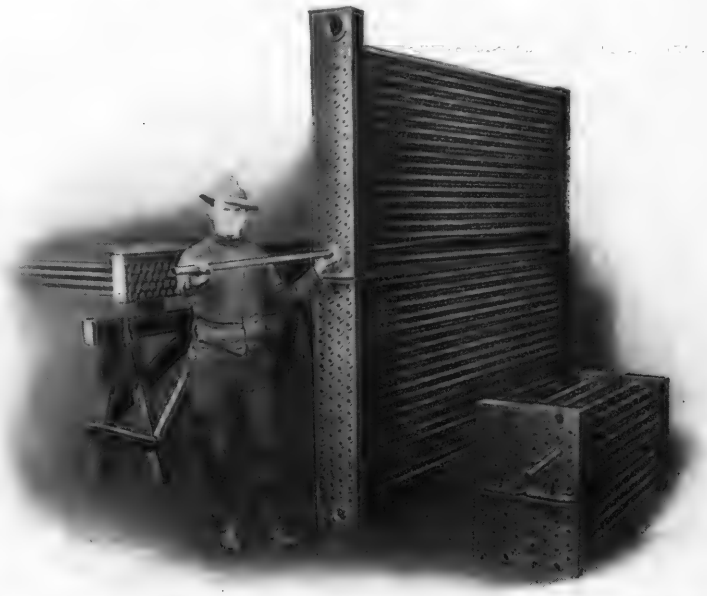
An Improved Form of Hot Blast Heater.

Various forms of coils have been used for hot-blast heaters, that is, air heaters employing steam or hot water used in connection with fans. Among the difficulties encountered in the design of such heaters are those relating to the discharge of air and water of condensation in such a way as to avoid air binding and water hammer, and the elimination of strains upon joints which produce leakage, by suitable means for taking care of expansion and contraction. Other important features are accessibility of the interiors of the tubes for inspection and cleaning, possibility of renewing tubes without disturbing other tubes and a construction adaptable for building up into the various shapes, capacities and forms that may be needed in practice.

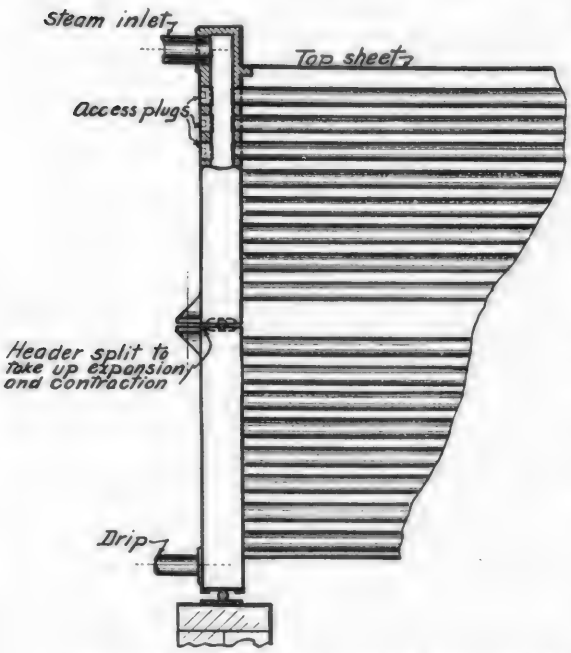
In the heater illustrated herewith, an attempt has been made to combine the solutions of as many of these problems as possible. The tubes are straight and all of the same length. They are expanded into front and rear headers, which consist of one-piece boxes with holes for the reception of the tubes and screw plug holes for access in rolling in the pipes and for inspection, cleaning, etc. The access plugs over the ends of the tubes are made steam

tight by means of a suitable composition. The tubes are rolled in or expanded. The holes for the tubes are reamed and the ends of the tubes turned to make them smooth. In the rear header the tubes are expanded against the cast iron and in the front header copper ferrules are used.

The front header is divided into two parts, an upper and a lower half, the lower supported by a roller which rests upon an iron plate upon the foundation, and the upper half, supported by a roller, resting upon the lower half, thus permitting free and independent movement. Flanges upon the two parts of the front header provide means by which they may be bolted together in order to avoid strains in handling and shipping, but when erected the bolts are removed, allowing free expansion.



REPLACING TUBE IN GREEN'S BOX-HEADER-TYPE HOT-BLAST HEATER COIL.



GREEN'S BOX-HEADER-TYPE HOT-BLAST HEATER COIL, SHOWING ACCESS PLUGS FOR GETTING AT TUBES AND ROLLERS SUPPORTING TWO HALVES OF FRONT HEADERS TO ALLOW FOR EXPANSION AND CONTRACTION.

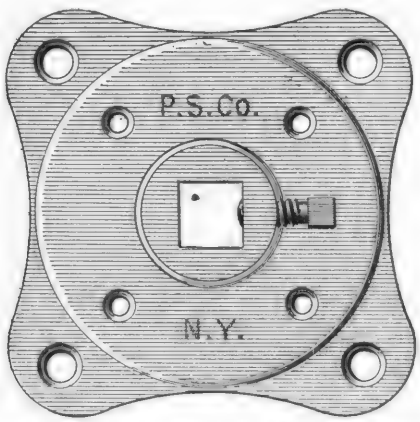
The steam, hot water or other fluid is introduced through a suitable connection into the upper part of the front header, flows through slightly inclined tubes to the rear header, descends to the lower part of the latter and returns through the lower half of the bank of tubes to the lower part of the front header, passing thence to the drip or outlet connection. The circulation is thus positive without short circuiting or pocketing and the steam assists the air and water of condensation in the natural direction of flow by gravity.

The sides of the headers are set tightly together, rendering unnecessary special housing or covering on the two sides and leaving only the top or bottom to be enclosed, depending upon whether the heater is to rest on the floor or to be suspended close to the ceiling. If it should be desired to apply insulating material, this may be done easily as the access plugs are of the socket type and are flush with the surface of the header.

This improved type of heater coil has been designed and is manufactured by the Green Fuel Economizer Co., of Matteawan, N. Y., to whom we are indebted for the foregoing information and for the illustration.

Parker's Damper Ball-Bearing Bushing.

A type of damper bushing which is designed to permit heavy dampers to operate without binding or other troubles, has been brought out by the Parker Supply Co., 515 West 45th Street, New York, and is known as Parker's damper ball-bearing bushing. As will be seen from the accompanying illustration, this device is applied to dampers such as are used in smokepipes, breechings, etc. The damper rests entirely on the pushing and not on the pipe, as is often the case. The manufacturers also call attention to the ease of installation. A rod is attached to the damper with Parker's damper rod clips, which are described in circular matter issued by the company. The bushing is then slipped over the rod, and bolted or rivieted to the side of the pipe. The freedom of the damper is assured as it rolls on the bushing. By tightening the set screw, the damper is held fast, preventing it from moving from side to side in the pipe. This device is made of



PARKER'S DAMPER BALL-BEARING BUSHING.

malleable iron, and can be bent to fit either round or square surfaces. It can also be had with either round or square holes. It is made in six sizes, ranging from 5/8 in, to 1¼ in.

New Bristol A. C. Electric Tachometer.

The field of usefulness for recording tachometers includes use in connection with all engines, machinery or revolving shafts wherever information is desired about the rate of speed at which shafting or any other devices are revolving.

A new electric tachometer of the A. C. type is being put on the market by the Bristol Company, Waterbury, Conn. Although this is an electric tachometer, no sliding contacts or brushes are used in it and no delicate millivoltmeter movements are required.

Two of the most important features of this electric tachometer are the induction magneto and the voltmeter movement. The magneto as shown in the accompanying illustration is of the induction type without any sliding contacts or brushes. The indicating and recording instruments are voltmeters. The indicating instrument is equipped with a Weston pivot jewel bearing voltmeter movement. The recording instrument is equipped with an improved Bristol voltmeter movement so designed that there is plenty of power available

BRISTOL A. C. ELECTRIC TACHOMETER.

for actuating the recording arm even though the recording pen is in continuous contact with the surface of the chart. This recorder can be furnished for use with either 12 in., 8 in., or 6 in. charts.

The accompanying illustration shows a combination indicating and recording unit which provides an indicating instrument for the operator at his post of duty and a recording instrument for the superintendent or foreman in his office.

Trade Literature.

MARSHALLING THE FOUR WINDS FOR HEALTH AND INDUSTRY is the title of one of a series of articles on the big industries of America written by F. Burnham McLeary and appearing in the March, 1914, issue of The World's Work. It is a story of the rise of the B. F. Sturtevant Company, with special reference to the career of B. F. Sturtevant, and of the enviable position the company occupies as a manufacturer of fans and blowers for heating and ventilation, as well as for many other purposes.

THERMOGRADE AND VAN AUKEN SYSTEMS OF HEATING, and the organization behind them, are the subject of a blanket folder sent out by the Consolidated Engineering Co., Chicago, showing a diagram of the company's organization, divided into engineering, operative, manufacturing and selling branches.

DETROIT MULTI-PORT GRADUATED VAPOR RADIATOR VALVE, made by the Detroit Lubricator Co., Detroit, Mich., is featured in circular matter showing the use of this fractional or graduated packless valve in connection with vapor heating, especially the way in which the size of the port opening may be permanently adjusted to meet the requirements of any radiator and balance the system. This valve is made in sizes running from ¾-in. to 1¾-in.

STURTEVANT HEATING AND VENTILATING of banks, offices, theatres, mercantile buildings, hotels, restaurants, kitchens, clubs and churches, published as the Public Building Section of its elaborate work, pictorially illustrating the use of Sturtevant heating and ventilating apparatus, has just been issued by the B. F. Sturtevant Co., Hyde Park, Mass. This publication, which is listed as Bulletin 1013, contains not only numerous views of each class of building equipped, but also photographic reproductions of the installations themselves, supplemented in several cases with plans of the apparatus and other features. Where the heating plans are shown, the illustrations are accompanied by descriptions of the installation. Under the title of "The Importance of Ventilation," interesting hints are given of the applicability of the Sturtevant system under various conditions. Sizes 10¾ in. x 7¾ in. Pp. 96.

DEPENDABLE STEEL VALVES, made by the Nelson Valve Co., Philadelphia, and designed especially for superheat, is the subject of new circular matter showing these valves in the making and under test. One of the illustrations shows bars of cold steel bent and twisted which, the circular states, is the ideal condition of the steel for making valves for superheated steam where the intensity of the heat and the severity of the pressure demand a touch, ductile, close-grained metal.

LABORATORY OZONE APPARATUS, designed to meet the demand of chemists and engineers for ozone-producing apparatus for laboratory use, is described in a new circular issued by the Sprague Electric Works, New York. This ozonator is similar in design to the company's standard industrial ozonator, but is somewhat simplified and is arranged for use on a bench or table. This outfit is built for operation on 110 or 220 volt, 60 cycle, alternating current, and has an output of 6½ grams of ozone per hour. Where no alternating current is available, a small motor generator set is supplied. The circular also describes the company's ozone mixers for the treatment of oils or other liquids, air filters for use with ozonators, and one type of its line of industrial ozonators. Size 3½ x 6 in. (standard). Pp. 8.

PATTERSON HOT WATER TANKS, for heating water for apartment houses, hotels, office buildings, stores, institutions and garages, made by the Frank L. Patterson & Co., New York, are featured in the company's circular matter as being especially applicable for high water or steam pressures, making them especially adaptable for use in high buidlings. Attention is called to the fact that these heaters are made of heavy boiler plate shells and that the tubes used are of seamless drawn brass. The heaters are furnished with storage capacities ranging from 150 gals. to 1,125 gals.

IDEAL HEATING JOURNAL for April, the publication of the American Radiator Company, contains, among other things, a general description of the Grand Central Terminal heating plant, New York, in which between 5,000 and 6,000 American radiators, totaling nearly 340,000 sq. ft. of direct radiating surface, are in operation. An article on "How Much Coal Does Your Heater Burn?" gives rules for determining this quality, based on average conditions. Another article on "Money to Loan on Radiator Installations" shows how sales may be increased for radiator heating outfits among property owners who are ready and eager to buy, but who may not have the cash means at hand to make prompt payment. This may be effected through mutual building and loan associations which have gone on record as considering such installations as fixed, enduring property.

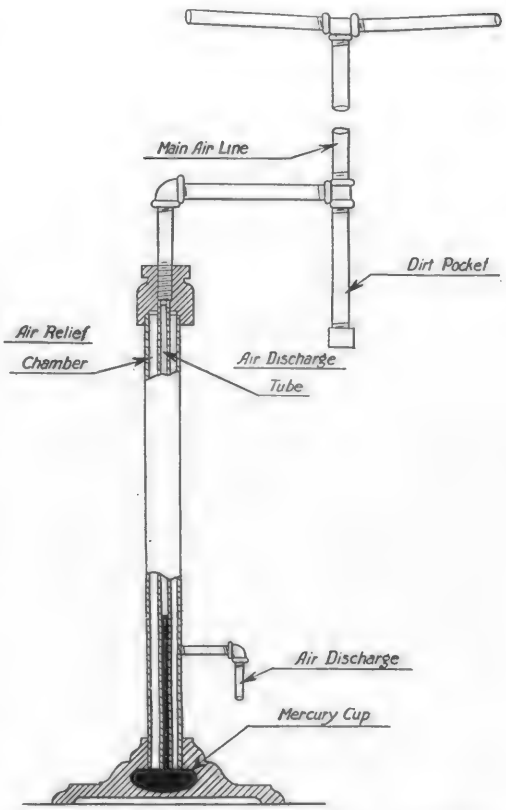
HARRINGTON MFG. CO., Boston, Mass., announces in newly-issued circulars that it is now prepared to deliver die stocks ranging from 1 in. to 2 in., cutting both right and left with the same set of dies, or double ended left, if desired. This die cuts 18 threads with the same set of dies. The tool is self-contained, with adjustable bushing jaws to set at any size indicated on die body.

PITOT TUBE AND FAN TESTING is the title of a notable publication in which this important and much-discussed subject is treated at great length. Although published by the American Blower Co., Detroit, Mich., the company states that it is published solely in the interests of standardizing procedure, so that fan ratings can be specified in a manner understood by all. The company does not manufacture or sell the instruments described. The treatise, which is issued as Bulletin No. 35, Series 1, mentions the advantages of the Pitot tube and urges a comparison of the different forms in common use. Descriptions are then given of the "ABC" Pitot tube and

the Taylor Pitot tube, showing how they differ; also of the Thomas meter. This is followed by descriptions of tests made at the University of Wisconsin, using the "ABC" Pitot tube and the Taylor Pitot tube, both in connection with a Thomas meter. Views are given of the arrangement of the apparatus for the test and the results are presented in tables and curves, together with an analysis of the results in which it is stated that the "ABC" form of Pitot tube gives the most accurate and reliable readings of the static pressure of any form of Pitot tube. Under "Method of Conducting Fan Tests" are given views of the proper arrangements of the apparatus for conducting such tests and the calculations to be used. The bulletin also contains miscellaneous tables and charts for use in simplifying the calculations. Size 8½ x 11 in. (standard). Pp. 32.

BERNHARD WATER TUBE BOILERS, described as "something different," are the subject of a catalogue (Catalogue B) recently issued by the manufacturers, the Kanawha Mine Car Co., Charleston-on-Kanawha, West Virginia. This boiler is the latest invention of J. B. Bernhard and is notable in requiring but 15 different hollow or cored castings to build the entire line. The boiler is so low that it can be installed in any basement deep enough for a man to stand in, thus making a pit unnecessary. The boiler is built in sections that have a series of tubes, set so that the fire strikes them at right angles. The Bernhard water tube boilers are made for both steam and hot water heating and the line includes a complete series of each type. In connection with the company's ratings, which include the B. T. U. delivered per hour, it is stated that with proper installation and attention, the ratings as given are guaranteed. Size 6 x 3¾ in. Pp. 20.

MERCURY SEAL VACUUM SYSTEM, made by the Vacuum Heating Company, Philadelphia, is described in an interesting circular devoted to this and the company's other heating specialties. With this device the air valves on the radiators are connected to the mercury seal which is located in the basement. When steam is generated in the heater at a few ounces pressure, it will flow into the piping, driving the air ahead of it and expelling it through a union valve down through the air line and out through the mercury seal. Its return to the system is prevented by the mercury reservoir in the bottom of the seal. As a result, when the fire is checked, the system may be operated on a vacuum. The makers state that temperatures from 100° F. to 250° F., or a range of 150° F., may be obtained at will. The catalogue shows several typical installations. Other parts of the catalogue are given over to descriptions of the



MERCURY SEAL USED WITH MERCURY SEAL SYSTEM OF VACUUM HEATING.

Keystone water and air relief valve, vapor damper regulators, and other specialties. Size 6 x 9 in. (standard). Pp. 16.

Ownership Notice

Statement of the ownership, management, etc., of THE HEATING AND VENTILATING MAGAZINE, published monthly at New York, N. Y., required by the Act of August 24, 1912.

Name of— *Post-Office Address.*

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Business Manager, Gustave Petersen, 1123 Broadway, New York.

Publisher, Heating and Ventilating Magazine Co., 1123 Broadway, New York.

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A. S. Armagnac, 1123 Broadway, New York.

Gustave Petersen, 1123 Broadway, New York.

Known bondholders, mortgagees and other security holders holding 1% or more of total amount of bonds, mortgages, or other securities:

None.

(Signed) A. S. ARMAGNAC, Editor.

Sworn to and subscribed before me this 12th day of March, 1913.

(Seal) (Signed) A. L. SCANTLEBURY, No. 64.

Notary Public, Kings County, Certificate filed in New York County.

(*My commission expres March* 30, 1915.)

Modern Vacuum Cleaning Apparatus

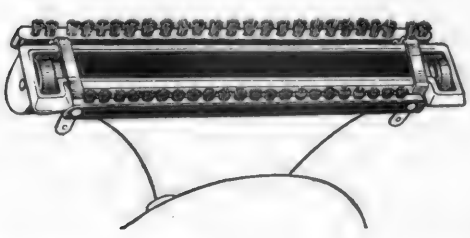
18.—Eureka Electric Vacuum Cleaner.

An interesting type of portable vacuum cleaner is that manufactured by the Eureka Sales Co., whose New York office is at 131 West 42d Street. It is of the self-contained type, operated by an electric motor and having the dust bag attached to the handle. The motor operates a steel fan which is capable of displacing 113 cu. ft. of air per minute.

The unique feature of the Eureka cleaner,

EUREKA VACUUM CLEANING MACHINE.

however, is its nozzle. This nozzle is 12 in. wide and is equipped with two small rollers. As they protrude a trifle below the opening of the nozzle, the tool is kept away from close contact with the carpet, permitting the easy passage of air and at the same time making the machine easy to operate. An extra attachment used with this nozzle is a floor brush, illustrated herewith, which, it is stated, is entirely effective in removing threads, ravelings, lint, etc., from carpets and rugs. The weight of the cleaner, 10 lbs., is always on the floor, the handle only resting in the operator's hand. The handle can be locked in a rigid position or



FLOOR-BRUSH AND ROLLERS ON INSIDE OF NOZZLE.

VIEW SHOWING UNIQUE CONSTRUCTION OF EUREKA DUST BAG.

made flerible, permitting it to be held at any angle during operation. Also the adjustment of the electric current is always under the operator's control, at the end of the handle.

The construction of the Eureka dust bag is also out of the ordinary. The bag has an inner tube running half way up the inside, so that the dust, after getting into the bag proper, drops to the bottom and remains there instead of being constantly churned by the air. The bag opens from the bottom instead of the top, and, as the dust is already settled at the bottom, it is easy to clean.

Heat Loss Tests on Railway Mail Cars.

Tests are being conducted by the University of Illinois for the purpose of bettering the heat insulating qualities of the walls of railway mail cars.

As now constructed, the walls of a steel mail car consist of two plates about 4 in. apart, the outer ⅛-in. and the inner 1-16 in. in thickness. Between these plates are vertical steel channels of a modified form, which serve as reinforcement to the plates. The railroads have been working under the impression that the heat loss was intensified by conduction from the inner to the outer wall by this steel channel, and as a result have been placing a ¼-in. layer of agasote insulating material between the steel plate and the legs of the channel. This is an expensive construction, as it is quite a problem to rivet these channels securely with the agasote in place. Moreover, this is being done

with no real knowledge of what effect the agasote has on the heat retaining qualities of the wall.

Prof. Arthur C. Willard, who is in charge of the heating and ventilating courses at the university, is making the tests. His apparatus consists of a box, the dimensions of which are 6 ft. each way. The walls of the box are of ⅞-in. tongue and groove siding, with 5 in. studding between. The air space is filled with granulated cork. This construction gives a well-insulated wall. One side of the box is removable, so that different sides may be substituted. The tests consist primarily in determining the heat resisting qualities of these different sides with various methods of insulation. Heat is supplied to the inside of the box by means of a resistance coil and the heated air is kept in circulation by an electric fan. The heat input to the box is figured from the total amount of current supplied to both the coil and fan. The current supplied to the fan must be taken into consideration, as its energy is dissipated in the form of heat which is taken up by the air in the box. The inside temperature of the box is ascertained by the average reading of six long-stem thermometers which are inserted at various points.

A coefficient of transmission of 0.096 was obtained using an insulated wooden side. A steel side with a ¼-in. layer of agasote under the channels gave a coefficient of 0.350. The next test to be made is with a steel side having no insulation whatever. After this, a test will be made on a steel section which has the space between the plates filled with some kind of insulating material. Prof. Willard is inclined to believe that this method of filling the space between the plates will serve to materially reduce the heat loss. He holds the opinion that the heat loss is not due entirely to conduction, but largely to convection, the air against the inner wall becoming heated, rises to the top and passes over to the outer wall where it loses its heat and falls, only to take up heat again and rise. Thus the air between the plates forms an endless chain which carries the heat from the inside of the car. By filling this space these convection currents will be broken up and their effect destroyed.

ADVERTISERS' INDEX

American Blower Co..... 69
American District Steam Co..... 14
American Radiator Co.....Back Cover
Armstrong Mfg. Co..... 65

Beach-Russ Co. 7
Best, John 77
Bicalky Fan Co..... 16
Bishop-Babcock-Becker Co. 66
Blomfeldt & Rapp Co..... 9
Bristol Co., The.....Front Cover
Buffalo Forge Co..... 6

Carrier Air Conditioning Co. of America. 5
Chicago Pump Co..... 65
Connersville Blower Co..... 3

Davis Regulator Co., G. M..... 10
Dixon Crucible Co., Joseph..... 77
Dunham Co., C. A. 16

Fischer-Sweeny Bronze Co..... 81
Fizgibbons Boiler Co.....Front Cover
Foster Engineering Co..... 10

Garden City Fan Co..... 72
Globe Ventilator Co.....Front Cover
Gurney Heater Mfg. Co.....Front Cover

Hackney Ventilating Co..... 13
Hornung, J. C..... 75

Ilg Electric Ventilating Co.....4, 5
Industrial Instrument Co..... 67
Iroquois Engineering Co..... 8

Jenkins Bros. 67
Johns-Manville Co., H. W..... 68
Johnson Service Co. 78

Kelsey Heating Co. 13
Knowles Mushroom Ventilator Co, Front Cover

Marsh & Co., Jas. P..... 12
Massachusetts Fan Co..... 3
Moline Vacuum-Vapor Heating Co.... 79
*Monash Engineering Co..... 63
Morehead Mfg. Co..... 11
Mueller Mfg. Co., H..... 11

National Steam Specialty Co..... 12

Parker Supply Co..... 77
Patterson Co., Frank L, Inside Back Cover
Patterson Publishing Co..... 79
Powell Co., The, Wm..... 79

Ric-Wil Underground Pipe Covering Co. 77
Ross Valve Mfg. Co.....Front Cover

Scaife & Sons Co., Wm. B..... 79
Simplex Electric Heating Co..... 7
Sims Co., The..... 82
Spencer Turbine Cleaner Co..... 72
Sprague Electric Works..... 76
Standard Thermometer Co..... 78
Sturtevant Co., B. F.....71, 73
Syracuse Faucet and Valve Co..... 82

United Vacuum Appliance Co..... 14

Webster & Co., Warren 9
Westinghouse Electric & Mfg. Co., Inside Front Cover
Wycoff & Sons Co., A..... 74

Zellweger & Sons, J..... 8

* Every other month.

TRADE AND MISCELLANEOUS NOTES

Coming Events.

May 26-29, 1914.—Sixth annual convention of the National District Heating Association, at Rochester, N. Y. Headquarters at the Seneca Hotel.

June 10-13, 1914.—Twenty-sixth annual convention of the National Association of Master Steam and Hot Water Fitters at Atlantic City, N. J. Headquarters at the St. Charles Hotel.

June 16-19, 1914.—Thirty-second annual convention of the National Association of Master Plumbers at Atlantic City, N. J. Headquarters at the Hotel Rudolf.

June 16-19, 1914.—Spring meeting of The American Society of Mechanical Engineers, at Minneapolis and St. Paul, Minn.

July 9-11, 1914.—Summer meeting of The American Society of Heating and Ventilating Engineers at Cleveland, O.

Deaths.

Prof. Dr. Hermann Rietschel, of Charlottenburg, Germany, a well-known personality in the heating and ventilating profession in this country, as well as in Germany, died recently at the age of 67. He was a member of the heating committee of the German Gas Association.

Oliver S. Kendall, senior partner in the firm of O. S. Kendall & Son, Worcester, Mass., heating contractors, died at his home in that city April 10, of pneumonia. He was 65 years old. Mr. Kendall had been in the heating business in Worcester since 1874 and was a member of the national

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master steam fitters' and master plumbers' associations. He was also a member of the Worcester Chamber of Commerce.

Miscellaneous Notes.

University of Wisconsin, Madison, Wis., announces the fourteenth annual six weeks' summer school of its College of Engineering, which will begin June 22. Courses of instruction and laboratory practice are offered in electrical, hydraulic, steam and gas engineering, etc. Additional particulars may be obtained by addressing F. E. Turneaure, at Madison.

National Metal Trades Association held its annual convention at Worcester, Mass., April 21-22.

J. Leland Wells, New York, heating and ventilating engineer, with his sons, Frederick H. Wells, electrical engineer, and Arthur S. Wells, sanitary engineer, has opened a consulting engineering office at 245 West 34th Street.

Wightman & Richards, New York, counsellors and consulting engineers in technical advertising, have moved to new quarters at 50 Union Square.

Burlington, Ia.—Owing to the new source of electric power at Keokuk, the matter of shutting the central heating system operated by the People's Gas & Electric Company in Burlington is under discussion. It is estimated that this step would mean the installation of over 80 separate boiler plants in the city. An alternative proposition is to divide the present system into a number of small units, each taking care of one or more blocks. The company planned to lay the subject before its patrons as soon as its April report was issued, with the possibility of continuing the system at higher rates, and operating it on live steam.

Union City, Ind.—The new Indiana Public Service Commission has just completed the valuation of the natural gas properties of the Union Heat, Light & Power Co. of Union City, for the purpose of fixing rates. It is certain that the method of valuation employed will be bitterly contested by the natural gas men. The result of the valuation was that the rates of the company were reduced from $1.10 per 1,000 cu. ft. to 56 cents per 1,000 cu. ft.

Laurium, Mich.—Interest in the central heating plant has recently been revived and there is a probability of such an enterprise being launched.

Buffalo, N. Y.—In a report made to the Board of Health on the heating and ventilating of the public schools of Buffalo, with special reference to School Nos 1, 56, 59 and 62, recommendations are made urging changes in future specifications to provide double inlet and outlet systems for all

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school-rooms and to have the outlet 20% larger than the inlets. The report also recommends the lowering of the humidity standard from 60 to 40 or 50%. The report was based on investigations made by the health commissioner, the city chemist, the deputy building commissioner and Drs. H. R. Hopkins, T. H. McKee and E. A. Bowerman, of the Erie County Medical Society. According to the report, many plants were found to be operated in an inefficient manner and a supervision of the janitor service is recommended, the suggestion being that it be made a part of the mechanical division of the bureau of building.

Eveleth, Minn.—The request of the city council that the Home Electric & Heating Co. name a figure for its plant and holdings in the city cannot be fulfilled, according to a letter written by the company, suggesting that an independent appraisal be made of its property.

Richmond, Ind.—For the purpose of reducing the cost of heating the city building, which has averaged $516 a year during the last four years, the Board of Works is considering the matter of using the exhaust steam at the municipal light and power plant by piping it to the city building. The estimated cost of this work is $2,500, as it would require 1,700 ft. of pipe placed 4 to 5 ft. underground.

Buffalo, N. Y.—Officials of the International Railway Co., who have been experimenting during the past two years with fourteen different kinds of car ventilating systems, announce that by next Fall every street car in that city will be equipped with an effective system of ventilation. This system consists of a series of small windows, fourteen on each side of the car, near the roof, which open out. At either end of the car is placed a shuttered louvre which remains open at all times and through which a constant current of air passes. The heating is obtained by the same device that is now used, running along the floor on the sides of the car.

Des Moines, Ia.—Plans for the establishment of a $500,000 central heating plant for the business district of Des Moines was discussed at a recent meeting of directors of the Commercial Club and executives of the Illinois Traction Co., of which the Des Moines Electric Co. is a subsidiary organization. The Illinois Company was represented by W. B. McKinley, president; H. E Chubbock, vice-president, and George Mattes, treasurer. W. H. Thompson, manager of the Des Moines Company, states that the project will involve $200,000 for increased boiler and engine capacity. Also, a line of 20-in. mains would be laid between the river and 11th Street, and between the railroads and the Grand Avenue.

Saskatoon, Canada.—The city commissioners have been directed to bring in a report covering the possibilities of using the exhaust steam from the power house at that point to heat the nearby buildings.

Goshen, Ind.—County Surveyor Wise has drawn plans for a remodeling of the heating system which now supplies the jail and

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courthouse. The expense is estimated at from $4,000 to $6,000.

Salt Lake City, Utah.—An ownership stamp for drawings and specifications that is designed to prevent such work from being used or stolen by others, has been drawn up by the Jesse Coogan Engineering Co., of Salt Lake City. It reads as follows: "These drawings and specifications accompanying same are the private and exclusive property of Jesse Coogan Engineering Co., Salt Lake City. If used or copied by others in whole or any part hereof (John Doe), and the owners of this building hereby agree to pay us $—— as liquidated damages in cash for same on demand." The company states that "many engineers, contractors et al. who have frequently gone to the trouble and expense of getting up a design or a drawing of some apparatus or mechanical system of some kind or another have been deliberately robbed of the skill, knowledge, experience, time and thought which was incorporated in their drawings either by a prospective owner or by some architect or other who would get some engineer or contractor to draw up plans and specifications for a certain piece of work and then boldly and deliberately appropriate same for their own use or the use of others. As all large mechanical concerns know there are many unscrupulous owners, cheeky draftsmen and embryonic engineers who are willing to appropriate the work of others along mechanical lines by copying plans, specifications, etc., whenever opportunity offers, we think if designers and engineers in all mechanical lines would adopt our plan of protection same would shortly put a stop to this kind of theft." The company makes a practice of stamping each drawing in two places and each print also in two places, and a price is inserted in each case sufficiently large to insure care on the part of architects or owners.

Charles R. Honiball, Liverpool, England, has been elected president of the National Association of Master Heating and Domestic Engineers at the annual meeting of the association in London in March. Mr. Honiball is a past president of the Institution (British) of Heating and Ventilating Engineers, and is a member of the American Heating Engineers' Society.

National Warm Air Heating and Ventilating Association is planning to hold another general meeting as early in the spring as possible.

Omaha, Neb.—The Bee Building Company has made a proposition to the city

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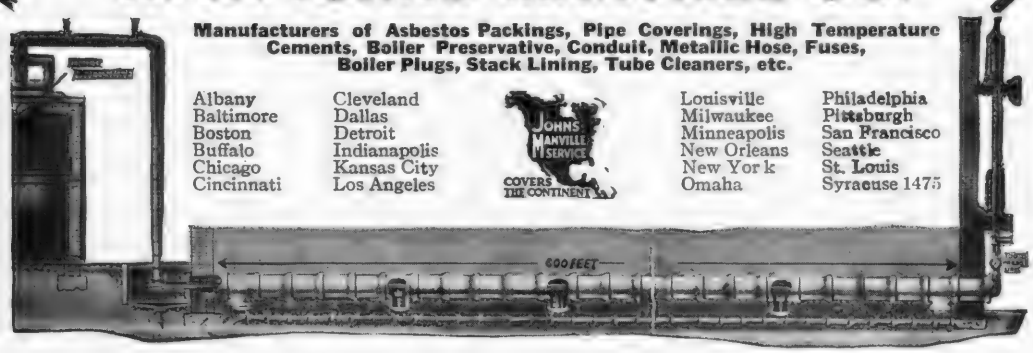

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council to heat the city hall from the Bee Building plant for $3,450 a year. The proposal contains these stipulations:

First—You to install in your heating plant a first-class vacuum system connecting the same with each radiator and placing on each radiator a Paul radiator valve. This system is to include a steam driven pump, the pump to be placed in our basement, we to care for it and furnish the necessary steam for operating it.

Second—You to connect your heating plant to the steam line in our building.

Third—You to connect your elevator pump to the proper steam line in our building.

Fourth—The above bid is based on your present radiation.

According to the controller's 1913 figures, the present annual cost of heating the city hall is as follows:

Coal	$2,486.68
Labor	2,880.00
Supplies	200.00
Boiler insurance	35.00
Depreciation	1,500.00
Interest at 5 per cent	750.00
Total cost	$7,851.68

The last two items are figured on an investment of $15,000 in the proposed new city hall plant.

Syracuse, N. Y.—Edward S. Dean, of the Pierce, Butler & Pierce Co., was the recipient of a testimonial on the part of 475 employees of the company's Eastwood plant, who presented him with a gold watch in recognition of his services as superintendent, in improving working conditions for the men.

William H. Smead has been appointed superintendent of the Central Station Hot Water Heating Co.'s plant at Nela Park, East Cleveland, Ohio.

Victoria, B. C.—A movement is under way to establish a central heating plant in Victoria to supply office buildings in the business district. The project is being furthered by DuCane, Dutcher & Co., engineers, and it is stated that the plant, if installed, will be operated by the Victoria Central Heating Co.

Manufacturers' Notes.

Magee Valve Co., New York, recently incorporated to manufacture valves, thermometers, and other specialties, has organized with the following officers: President, F. H. Tweed; secretary, D. H. Schubert. The company's quarters are located at 105 Beekman Street.

Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., announces that its Philadelphia

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Can be used to great advantage in connection with cooling and exhausting odors from kitchen, smoke from club rooms, ventilating toilet and bath rooms.

They deliver twice the amount of air as the ordinary steel plate fan, hence require only **one-half** the space for the same duty.

Sirocco Multi-Blade Fans operate quietly and require **less power** to deliver the same amount of air when compared to the ordinary steel plate fan twice the diameter. They are easy to install and are nicely adapted to sheet metal work.

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office will hereafter be located on the sixth floor of the Abbott Building, Broad and Race Streets. The company will continue to carry a full line of boilers, radiators and supplies at its Philadelphia warehouse.

Pratt & Cady Co., Inc., Hartford, Conn., announces its acquirement of the entire business of the Pratt & Cady Co. There will be but slight changes made in the personnel of the organization and in the manufacture and sale of the line of valves, cocks and hydrants manufactured by the old company.

Shirley Radiator & Foundry Co., Indianapolis, Ind., it is announced, is now out of the receiver's hand and has been reorganized with the following officers: President, E. L. McKee; vice-president, L. B. Martindale; secretary, Robert Martindale; treasurer, S. E. Rauh. Directors: L. C. Boyd, John T. Martindale and above-named officers. The company's plant at Neech Grove will be in charge of Frank Leavitt, formerly of the United States Radiator Corporation.

A. M. Byers Co., Pittsburgh, Pa., is planning to enlarge its Girard plant to provide for additional puddling furnaces. It is also reported that the company's pipe mills at Pittsburgh will be moved to Girard.

Braman, Dow & Co., Boston, Mass., jobbers of heating and plumbing supplies, have moved into their new building at 239-245 Causeway Street, where its former quarters were burned a year ago.

Reorganization of the Pierce, Butler & Pierce Mfg. Company.

A plan for the reorganization of the Pierce, Butler & Pierce Mfg. Co., of Syracuse, N. Y., which has been in the hands of a receiver, was proposed at a meeting of creditors and preferred stockholders, held April 14, and will be carried out as proposed. It was drawn up by representatives of Spencer, Trask & Co., Theodore Ahrens, president of the Standard Sanitary Mfg. Co.; Richard Garlick, treasurer of the Youngstown Sheet & Tube Co.; M. J. Alexander, of the Pittsburgh Valve Co.; Clarence V. Kellogg, of the Kellogg-Mackay Co.; J. P. Duryea, of the Colwell Lead Co.; Campbell, Heath & Co., and representative of the Pierce, Butler & Pierce Mfg. Co. According to this plan, a separation will be effected of the Pierce, Butler & Pierce Mfg. Company from the Kellogg-Mackay Company, of Chicago, and each company will operate as a separate concern.

One of the first steps in the reorganization of the Pierce, Butler & Pierce Company will be the issuance of $500,000 of twenty-year 6% first mortgage bonds on its plant in Syracuse. Also the Kellogg-Mackay Company will issue $500,000 of 7% preferred stock, while the new Syracuse company will issue $700,000 of 7% preferred stock, besides $150,000 second preferred 6% non-accumulative stock to holders of the first preferred stock of the Kellogg-Mackay Co. Pierce, Butler & Pierce Company will also issue common stock to the value of $1,200,000, of which $400,000 in the Chicago company will be held by the Syracuse company and the other $800,000 sold to the new management of the Pierce, Butler & Pierce Company. All over $800,000 will be kept in the company's treasury for the present.

A voting trust of five members is provided for the Pierce, Butler & Pierce Company, consisting of Theodore Ahrens, Richard Garlick, M. J. Alexander, a representative of Spencer, Trask & Co., and of Campbell, Heath & Co., the voting trust to continue for five years. The plan as proposed will become operative when the $500,000 in bonds are sold, together with $400,000 of the common stock.

The new directors of the Pierce, Butler & Pierce Company will be Theodore Ahrens, Richard Garlick, M. J. Alexander, Clarence V. Kellogg, J. P. Duryea, one Syracuse representative and one representative of Spencer, Trask & Company.

Kellogg-Mackay Company, it is stated, has assets of $1,271,000, which will be offset by an issue of $500,000 preferred stock to the creditors and $400,000 of common stock held by the Syracuse company.

The Pierce, Butler & Pierce Mfg. Company has quick assets of $1,271,000, which added to the $400,000 common stock of the Kellogg-Mackay Company, $75,000 in real estate and $500,000 equity in the Syracuse plant, brings the company's net assets to $2,246,000. The indebtedness of the Syracuse company was placed at $2,050,000 and its present liabilities amount to $2,200,000.

Holders of preferred stock in the Pierce, Butler & Pierce Company who decline to enter into the reorganization plan will receive one-third of the value of their holdings, otherwise they will receive about one-half of the value of their securities.

Thomas & Smith, Inc., 118 North Carpenter Street, Chicago, has been declared bankrupt as the result of a petition filed by the Century Electric Company, Cutler Hammer Mfg. Co. and the Ilg Electric Ventilating Co. The company's liabilities are placed at $150,000 and the assets at $75,000.

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New Incorporations.

National Stoker Co., Wilmington, Del., capital $300,000, to manufacture boilers, stokers and heating apparatus. Incorporators: G. W. Dillman, B. M. Grawl and M. L. Horry.

Reed Plumbing & Heating Co., Davenport, Ia., capital $10,000. Incorporators: H. F. Schulze, M. V. Schulze, both of Portage, Wis., and Miss Evaline G. Reed, who for some time has been conducting the business of the late Clark E. Reed at 226 East Third Street. The new company will be located at that address.

Hamtramck Plumbing & Heating Co., Lansing, Mich., capital $10,000.

United States Radiator Corporation of Massachusetts, Boston, Mass., capital $10,000. Incorporators: William H. Thayer, Henry C. Mowry and Frank P. Perry.

Bryan Plumbing & Heating Co., Bryan, O., capital $4,500.

Saginaw Heating Co., Saginaw, Mich., capital $15,000, organized to install a central heating plant in Saginaw. Herbert F. Wills is at the head of the company.

John Richard, Jr., Plumbing & Heating Co., Johnstown, Pa. The principals are John Richards, Jr., John B. Naylor, Darrell Hockensmith and H. H. Britcher. The principals were until recently connected with the Morrellville Plumbing & Heating Co.

Central Plumbing & Heating Supply Co., Chicago, Ill., capital $25,000, to manufacture and deal in boilers, etc., steam and hot water heating supplies, specialties, plumbing, etc. Incorporators: R. G. Smith, T. A. Murphy and others.

Ventilating Utilities Co., Richmond, Va., capital $100,000 to $200,000. President, S. P. Mayer; secretary, H. A. Bartholomew, both of Norfolk.

Thomas Hindley & Son, New York, capital $5,000, to conduct a steam fitting, plumbing and roofing business. Incorporators: John H. Hindley, 131 West 75th Street, Charles T. Hindley and Henry Franke.

Runyon & Ogden, Binghamton, N. Y., capital $5,000, to conduct a heating contracting business. Incorporators: Charles C. Runyon, A. A. Runyon and William C. Ogden.

Peck Plumbing & Heating Co., Wellsburg, W. Va., capital $5,000. Incorporators: W. H. Neuhard, J. Y. Neuhard, J. W. Jones and others.

Millhouse-Graves Co., Buffalo, N. Y., capital $10,000, to manufacture heating and ventilating apparatus. Directors: James H. Millhouse, Agnes B. Millhouse, Harwood M. Graves and Ethel Graves.

National Heater Co., Cleveland, O., capital $100,000, to manufacture a new line of heating boilers. One of the principals is A. L. Stowell, formerly connected with the Cleveland branch of the American Radiator Company and later with the Chafer Co., of Cleveland.

Jedlicka Bros., Sayville, N. Y., capital $40,000, to conduct a heating and plumbing

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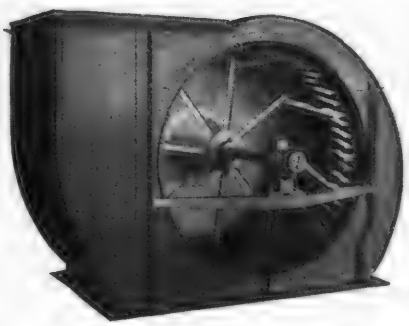

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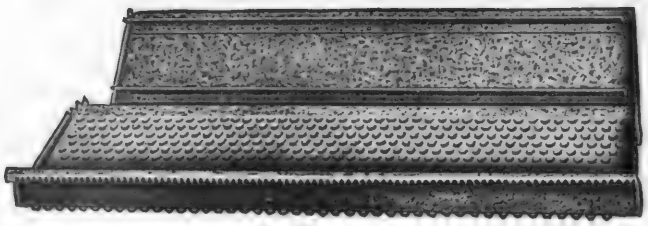

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These eliminators are positive in action. They remove every drop of entrained moisture discharging the air clean and dry.

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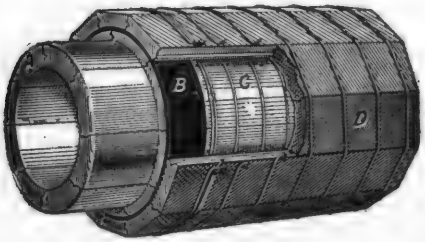

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business. Incorporators: T. J. Jedlicka, J. J. Jedlicka and E. F. Jedlicka.

Zindle-Cook Co., Seattle, Wash., capital $10,000, to conduct a heating and plumbing business. Incorporators: Gilbert Zindle and E. V. Cook. Quarters have been opened at Ninth Avenue, near Pine Street.

Price-Murphy Co., Chicago, capital $10,000, to conduct a contracting business for heating, ventilating and plumbing work. Directors: W. J. Price and E. H. Murphy, both of Chicago. The company has opened offices at 167 West Washington Street, Chicago.

Young Plumbing & Heating Co., Canton, O., capital $15,000. Incorporators: J. A. Young, Nettie Young, Charles Hentges, Jr., C. I. Streby and Lewis H. Fogle.

Continental Valve Co., Chicago, Ill., capital $2,500, to manufacture heating specialties. Incorporators: John J. Falvey, Albert E. Massey and William L. Bartian.

M. F. Rourke Plumbing Co., Knoxville, Tenn., capital $5,000, to conduct a heating and plumbing business. Incorporators: M. F. Rourke, M. E. Dykes, W. E. Sams and Charles H. Smith.

Apex Heating & Mfg. Co., Seattle, Wash., capital $10,000. Incorporators: W. C. Phillips and J. H. Welch.

Electric Steam Radiator Co., Portland, Me., capital $200,000, to manufacture electrically heated fixtures. President, J. D. Ross; treasurer, C. T. Sweet, both of Portland.

Simmons Vapor Vacuum Co., Chicago, capital $2,000, to manufacture heating specialties. Incorporators: Edward G. Farley, Daniel J. Ward, and Charles H. Simmons, 139 North Clark Street, Chicago.

Rollins Steam Specialty & Valve Co., Chicago, Ill., capital $25,000, to manufacture steam specialties. Incorporators: E. M. Ashcroft, E. M. Ashcroft, Jr., and C. E. Rathbun.

Longley-Lamberson Co., Toledo, O., capital $10,000, to conduct a heating and plumbing business. Incorporators: A. C. Longley, H. J. Lamberson, J. L. McGeorge, M. D. Merrick and A. S. Close.

Hunt Bros. & Pettie, Inc., Greensboro, N. C., capital $10,000, to conduct a heating and plumbing business. Incorporators: A. C. Longley, J. M. Hunt, H. W. Hunt and P. M. Pettie.

Clark-Severn Co., Farley, Ia., capital $10,000, to conduct a heating and plumbing business. Incorporators: George A. Gibbs, William A. Severn and Frank R. Clark.

Frank J. Lochen Co., Chicago, Ill., capital $2,500, to install heating and ventilating systems. Incorporators: Frank J. Lochen, M. F. Ryan and W. J. Lewis.

Contracts Awarded.

Thomas Heating Co., Racine, Wis., heating and ventilating new high school building at Mauston, Wis., for $9,500.

Blake & Williams, New York, heating and ventilating Hawthorne School, at Newark, N. J., for $9,140.

John H. Cooney, Newark, N. J., heating and ventilating West Side School, in that city, for $12,690. The bid is for the work with the air washer omitted.

J. C. St. John Plumbing & Heating Co., Colorado Springs, Colo., heating and plumbing of new and existing buildings and cottages of the Cragmor Sanitarium at Colorado Springs, for $16,779.

Candee & Osdoba, Wells, Minn., heating K. C. Building at Wells.

Delahuntly Co., Decatur, Ill., heating and plumbing new county hospital at Waterloo for $5,704.

American Heating & Construction Co., Los Angeles, Cal., steam heating new high school building at Santa Paula. Other bidders were: Machinery & Electric Co., $6,513; Munger & Munger, $6,553; E. D. Hough, $6,920.

Urbauer-Atwood Heating Co., St. Louis, Mo., heating new $500,000 Black Hawk Hotel at Davenport, Ia., for $36,580. The Johnson system of heat regulation will be installed. The plumbing contract went to the Ryan Plumbing & Heating Co., Davenport, at its bid of $45,861.

Mathey Plumbing Co., LeMars, Ia., heating and ventilating new school building at Laurens, Ia. The plumbing work went to Aug. F. Mueller, Webster City. The two contracts amount to $9,281.

Newman Heating Co., Grand Rapids, Mich., heating the Braudy Building. The plans were drawn by Wernette, Bradfield & Mead, Grand Rapids.

Kennison Bros., Dallas, Texas, heating and ventilating new $75,000 high school at Bonham, Texas. The plumbing contract went to Charles Davis & Co., Bonham.

Peter Johnson & Sons, Decorah, Ia., heating Decorah Hospital buildings at that place.

Peninsula Heating & Plumbing Co., Laurium, Mich., heating and ventilating new $160,000 administration building of the Marquette Normal College for $10,440. Other bidders were: W. S. Patterson, Appleton, Wis., $10,665; Lake Superior Steam Heating Co., Ishpeming, Mich., $10,730; E. J. Sink, Marquette, $11,289; Swanson Bros., Negaunee, $11,483. A Webster vacuum heating system will be installed.

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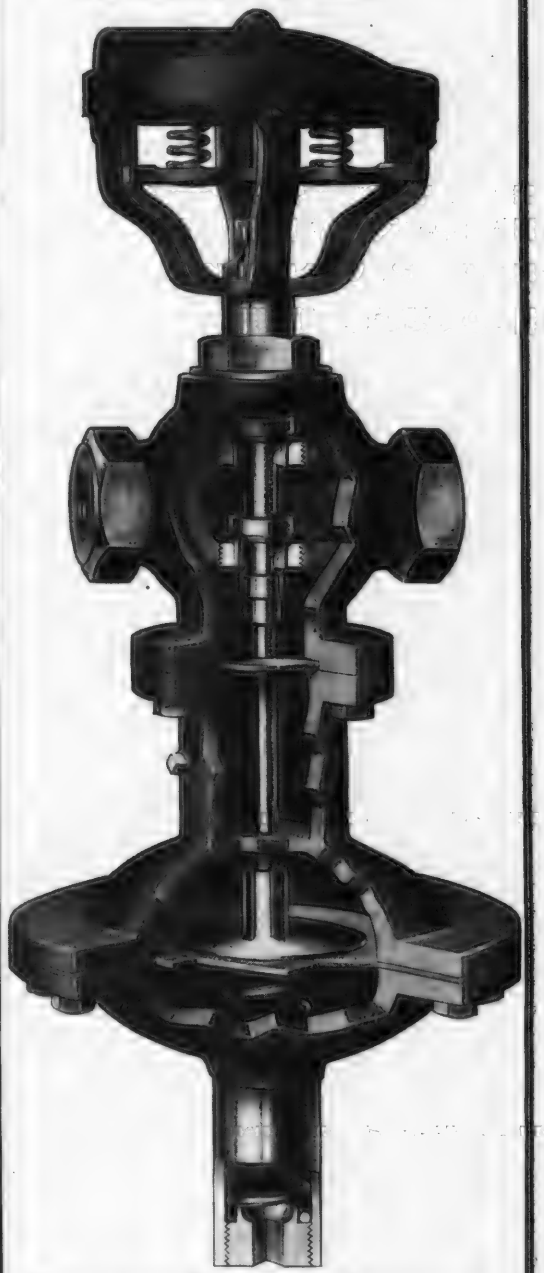

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tral school building at Frankfort, Ind., for $13,000. The board decided not to include a heating system for the high school in the contract, as had been done in the first contract awarded to Lewis & Kitchen, of Chicago, upon which the bid was $27,000 The heating of the high school will be considered later.

Keckonen Hardware Co., Red Jacket, Mich., heating and plumbing Murphy Building at Houghton, Mich.

Hutzel & Co., New Castle, Ind., heating and ventilating and plumbing Muncie High School building at Muncie for $40,000.

Westfield, Mass.—Bids were received as follows for the heating and ventilating of the proposed new school building at Westfield, the contract not being let, as the bids exceeded the estimates: George H. McLean, Springfield, $4,225; Wyckoff & Lloyd Co., Springfield, $4,500; Milner & Bill Co., Springfield, $4,442; Albert B. Franklin, Boston, $5,137; Huey Bros. Co., Boston, $4,582; Mosely & Mashin Co., Westfield, $5,122; Robbins, Gamwell & Co., Pittsfield, $4,650; Holyoke Valve & Hydrant Co., Holyoke, $4,340; Holyoke Supply Co., Holyoke, $4,340.

W. F. Sheahan, Topeka, Kan., heating and plumbing new State Sanitarium for the Tuberculosis Insane at Norton, Kan., for $7,500.

Wallace Bros. Co., Lafayette, Ind., heating and plumbing office building for the Lafayette Loan & Trust Co., at Lafayette, for $10,000.

Hanley-Casey Co., Chicago, heating new Statler Hotel at Detroit, Mich. The plumbing contract went to John Degnan. The hotel will contain over 800 rooms.

Howe & Bassett, Rochester, N. Y., heating and ventilating new courthouse building at Rochester for $32,400.

John Bays, Wichita, Kan., heating and plumbing new convent of the Sisters of St. Joseph, at Wichita, for $5,990.

Johnson & Larsen, heating new 18-story Kresge Building at Detroit, Mich. The plumbing contract went to the George H. Soffel Co. A Dunham vacuum heating system will be installed.

Fresno, Oregon.—Bids were received as follows for the heating and ventilating of the Sanger Union High School: E. A. Hansen, $4,771; Barret Hicks Co., $6,711; Visalia Plumbing Co., $3,572; Pacific Blower & Heating Co., $3,585.

Arthur McKinley Co., Kansas City, Mo., heating and plumbing new Montgomery Ward building at Kansas City. The building will be eight stories in height and will contain a floor space of 48 acres. The contract includes 80,000 sq. ft. of radiation.

Home Heating & Plumbing Co., Monroe, La., heating and plumbing new Vinton school building for $4,200.

P. J. Hoft, Philadelphia, heating and plumbing new building for L. Mulinary on Eighth Street for $5,000.

Richard & Chard, Bridgeport, Conn., heating and ventilating new school building on Bostwick Avenue for $3,785; the plumbing went to the W. P. Kirk Co. at its bid of $3,759.

L. W. Pomerine Co., Lincoln, Neb., heating, ventilating and plumbing new school building at Grafton, Neb., for $4,000.

J. P. & A. M. Shuster, Joliet, Ill., heating and plumbing new addition to St. Joseph's Hospital, in that city, for $6,000.

Taylor-Flagg Co., Hartford, Conn., heating and ventilating high school building, in that city, for $27,388.

Ben Olsen & Co., Tacoma, Wash., heating and ventilating State Normal School, at Cheney, for $23,000. A vacuum cleaning plant will be installed by P. J. Coff, Spokane.

Scott Co., San Francisco, Cal., heating Hyman Estate Building in San Francisco for $5,880; the plumbing contract went to F. W. Snook, at his bid of $13,050.

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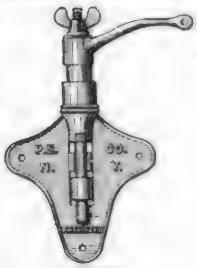

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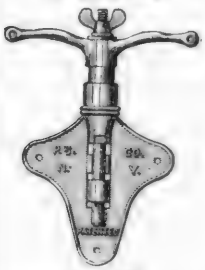

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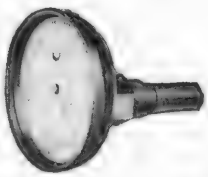

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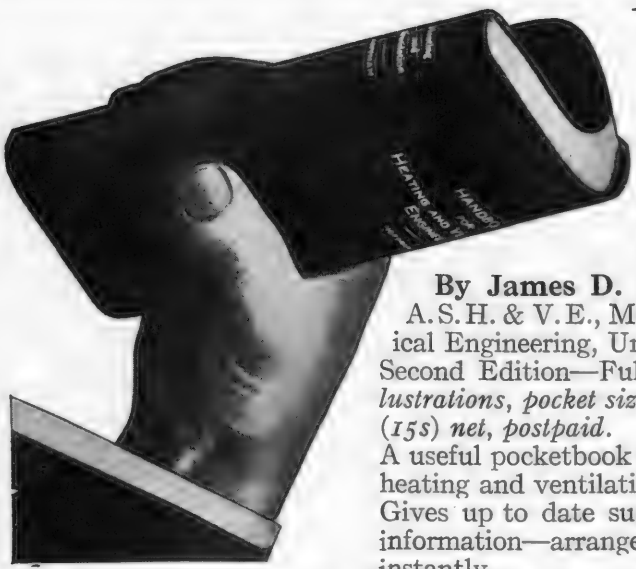

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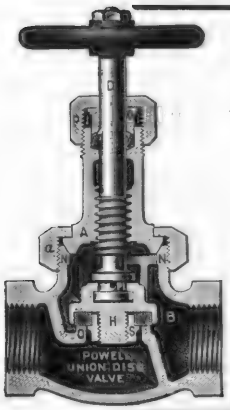

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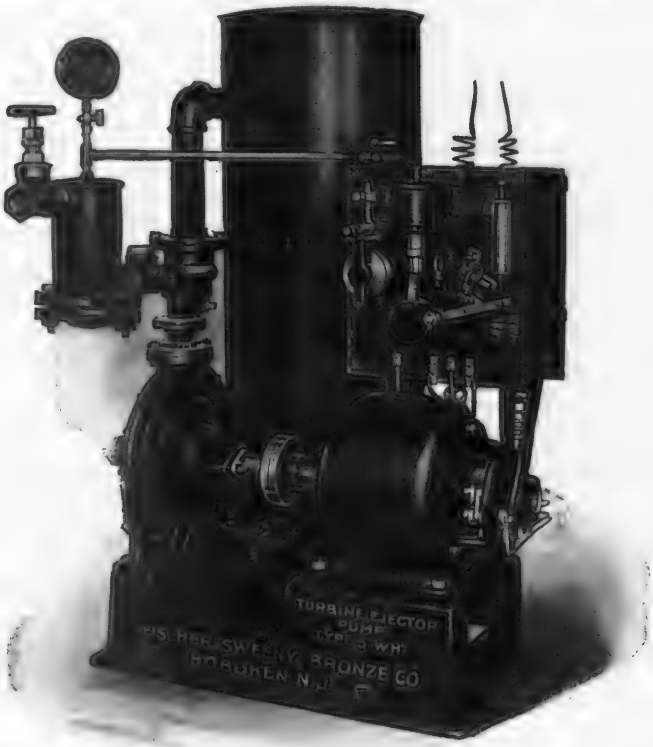

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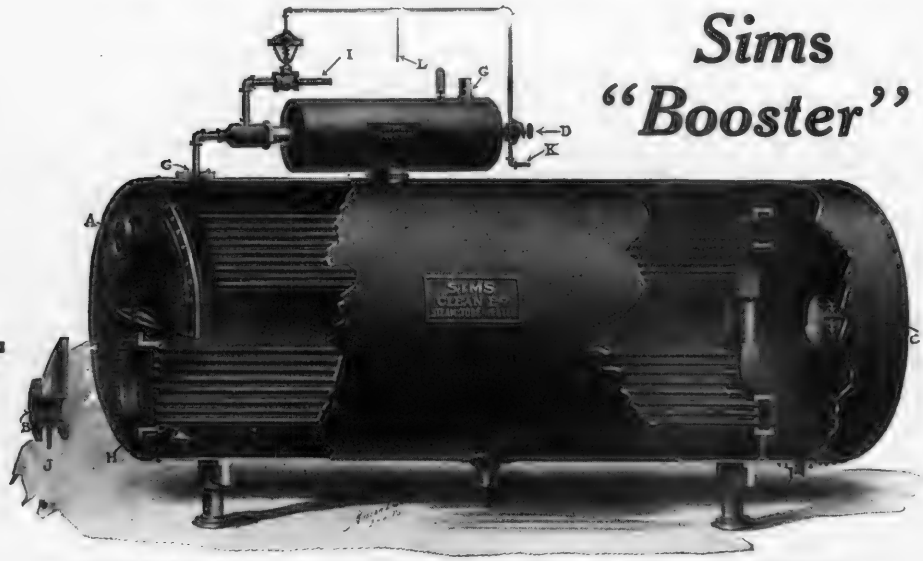

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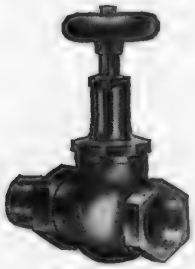

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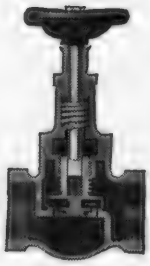

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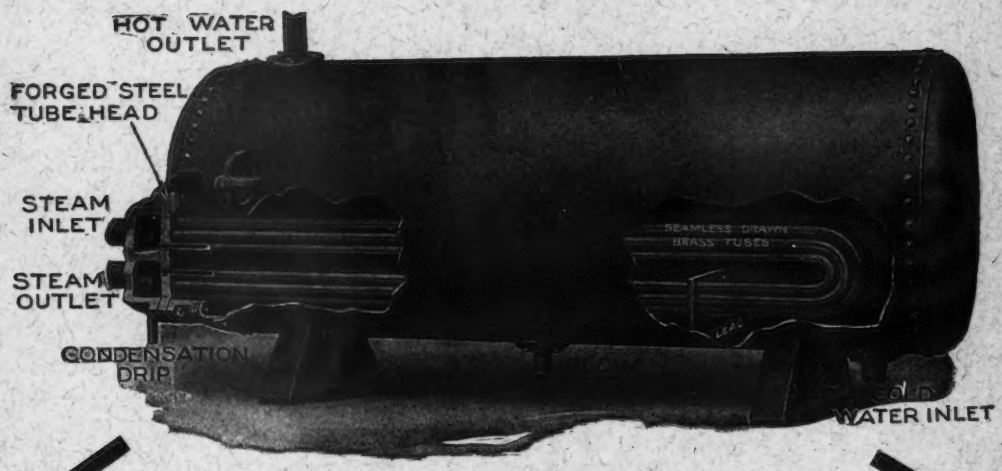

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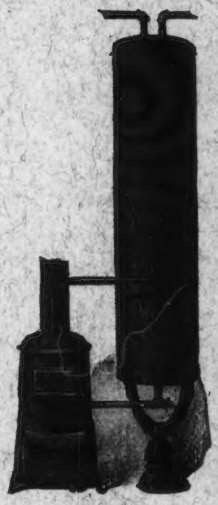
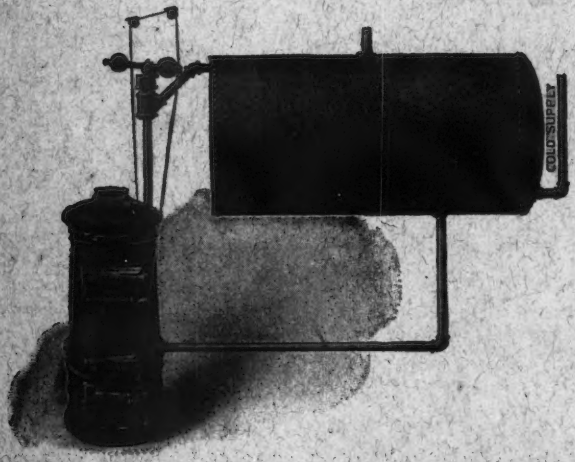
While planning for next Fall's *heating* sales, don't overlook this Spring's *heater* sales. The heating season will soon be over, and hundreds of homes in your locality will be confronted with the problem of summer hot-water supply. An IDEAL Water Heater in your show window will remind your customers how to solve this problem in the most practical and economical way, and it will help to make sales for you.



Shows a No. 00 IDEAL Water Heater connected to vertical tank. For all IDEAL Water Heaters reliable capacities are published based on different firing periods and for temperature rises of from 25 to 100 degrees per hour. See Ideal Fitter, pages 220 to 230.

IDEAL Water Heaters

supply abundant hot water all the time at a cost of but a few cents a day. Cheaper than gas, and the supply is constant. Moreover, an independent heater is an all the year 'round economy. It does not reduce the efficiency of the heating outfit like pipe coils in the firepot, and the temperature of the water can be kept uniform regardless of weather conditions. Just tell your customers some of the things *you* know about independent IDEAL Water Heaters—it will mean profitable sales. Now is the time—and we will be glad to furnish printed matter that will help.



Ideal Water Heaters are made in sizes to fit cottages, residences, apartments, hotels, to heat water for manufacturing purposes, etc. Illustration shows a No. A-12 Ideal Junior Water Heater connected to large Horizontal Tank and a No. 45 Ideal Sylphon Water Regulator for controlling the temperature of the water.

AMERICAN RADIATOR COMPANY

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